FOUNDRY

A PENTON PUBLICATION

JANUARY
1958

Permanent Mold Casting —Page 98

✔ Controlling the CO_2 Process —Page 94

✔ Casting Surface Finish —Page 78

✔ Efficient Cupola Operation —Page 89

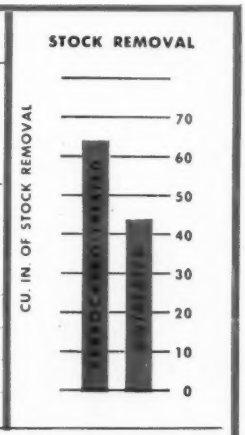
PROVED BY INDEPENDENT LABORATORY TESTS:

48.5% S•M•I*

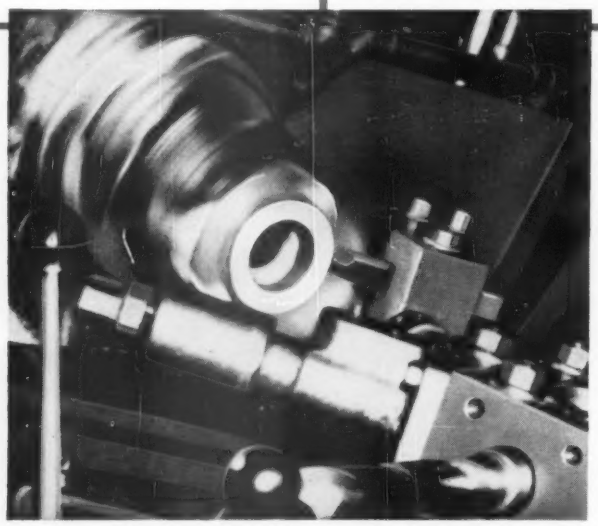
for FERROCARBO®-TREATED IRON

These impressive test results were obtained by an independent research laboratory on gray iron farm equipment castings produced by a leading Midwest foundry, using untreated and FERROCARBO-treated iron of identical chemistry.

Chemical Analyses	Untreated	Ferrocarbo® Treated
TC	3.51	3.54
Si	1.91	1.82
CE	4.15	4.15
Cutting speed (ft./min.)	300	300
Feed (in./rev.)	.009	.009
Depth of cut (in.)	.062	.062
Wear Land (in.)	.020	.020
Vol. of metal removed (cu. in.)	42.5	63.0
Weight of metal removed (lbs)	10.9	16.2
Percent improvement		48.5%



* Surface Machinability Improvement
Tool wear tests were conducted with a single point "Carboloy" grade 44A tool on castings machined at commercial speeds. Flank wear was measured with a 20 power microscope.



FERROCARBO Briquettes — the patented cupola additive by CARBORUNDUM®—are widely used by foundrymen to produce sound iron castings with exceptional strength, ductility and hardness properties. Tests have demonstrated that FERROCARBO-treated iron has considerably better machining properties than undeoxidized iron due to structure control and freedom from segregation. High production industries seeking to reduce costs are buying castings produced by the FERROCARBO cupola deoxidation process as an effective means for increasing production through improved casting machinability.

WRITE FOR MORE INFORMATION on how FERROCARBO produces more machinable iron regardless of metal composition. Ask for booklet A-1409, Electro Minerals Division, The Carborundum Company, Niagara Falls, N.Y.

ELECTRO MINERALS DIVISION

The CARBORUNDUM Company

REGISTERED TRADEMARK

FERROCARBO DISTRIBUTORS — **KERCHNER, MARSHALL & CO.,** PITTSBURGH • Cleveland • Buffalo • Philadelphia • Birmingham • Los Angeles • Canada
MILLER & COMPANY, CHICAGO • St. Louis • Cincinnati

84-79 R

Circle 551 on Page 51

B.F.Goodrich report:

Photo courtesy of Whirl-Air-Flow Corp., Chicago, Illinois.

Pipe carries sand the easy way

B. F. Goodrich improvements in rubber brought extra savings

Problem: In this foundry, workmen used to push wheelbarrows loaded with sand to the coremakers. Now the sand is simply blown through those overhead pipes to hoppers all over the building. Only one trouble.

A flexible hose was needed to switch the sand from one pipeline to another. (See inset.) Rubber hose was tried. The swirling sand quickly wore holes in it. Another kind stretched so much from the constant flexing that it jammed the switch.

What was done: When a B.F.Goodrich man heard of the problem he recommended a hose, specially developed by B.F.Goodrich to handle rough materials. It is made with a special wear-resisting rubber, so tough it outlasts hard steel 10 to 1 on many jobs. The hose has a specially treated fabric reinforcement that keeps it from stretching.

Savings: The B.F.Goodrich hose was tried. Instead of digging in and cutting, the sharp particles of sand simply bounce off the extra-soft rubber lining. It has now given 2 years of service and shows no signs of wear or stretch. In fact, the company making this equipment is now using only B.F.Goodrich hose.

For information: This hose is one of hundreds of kinds B.F.Goodrich makes for thousands of industrial uses. Your B.F.Goodrich distributor can recommend a hose exactly fitted to meet the special requirements of your work. And, as a factory-trained specialist, he *can* answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Dept. M-252, Akron 18, Ohio.*

B.F.Goodrich

INDUSTRIAL PRODUCTS

Circle 554 on Page 51

STEEL CASTING PRODUCERS...

how good is your Bentonite?

1	yes ☐ no ☐	Does your Bentonite meet Steel Founders requirements?
2	yes ☐ no ☐	Is it high gelatinating (or high viscosity)?
3	yes ☐ no ☐	Will your Bentonite absorb moisture and hold it?
4	yes ☐ no ☐	Is it unadulterated, untreated?
5	yes ☐ no ☐	Is it Western Bentonite?
6	yes ☐ no ☐	Is it always uniform? Controlled?

If you can answer "yes" to the following questions, chances are you have no Bentonite problems. If you get some "no" answers, why not fill out this coupon for a discussion with one of our technical representatives. He can arrange to have you test FEDERAL GREEN BOND H-J in your foundry.

Archer-Daniels-Midland Company
Federal Foundry Supply Div.
2191 West 110th Street
Cleveland 2, Ohio

Will you please have your Technical Representative arrange for a test of GREEN BOND BENTONITE H-J in our foundry.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

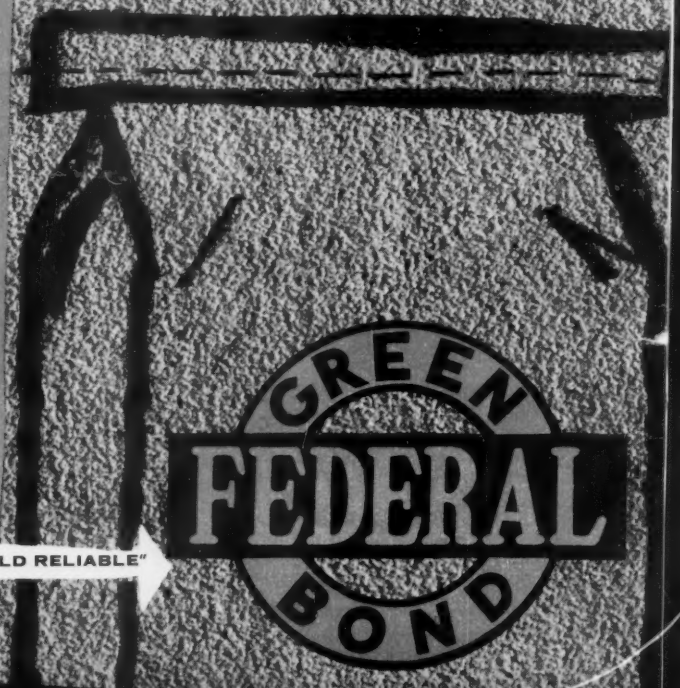
CITY_____ ZONE____ STATE_____

FEDERAL GREEN BOND BENTONITE H-J*

(*High Gelatinating)

MEETS STEEL FOUNDERS REQUIREMENTS

There's a good reason . . . GREEN BOND H-J is a single-purpose Bentonite produced *exclusively* for use in molding sand in steel foundries. It is carefully selected and quality controlled without the addition of chemicals or adulterants from the mine to your plant. Thus, it is always uniform. H-J means high gelatinating, the characteristic denoting high moisture absorption and retention with maximum bonding strength. Most important, this high quality Wyoming (Western) Bentonite completely meets Steel Founders requirements. FEDERAL GREEN BOND H-J comes in pulverized or granular forms to answer your specific mixing requirements. Available for immediate shipment in 100# multi-wall paper bags or bulk hopper cars.



Circle 555 on Page 51

Archer-Daniels-Midland company

FEDERAL FOUNDRY SUPPLY DIVISION

2191 West 110th Street • Cleveland 2, Ohio

FOUNDRY
A PENTON PUBLICATION

January 1958
Volume 86—Number 1

Editorial 77

SPECIAL ARTICLES

Factors Affecting the Surface Finish of Steel Castings 78
First article in series reviews research into burnt-on sand and considers recent advances in molding materials and techniques—By D. V. ATTERTON

Shrinkage in Tin Bronze 84
Second article in series studies problems of dissolved gases in tin bronzes and discusses methods of preventing gas pickup—By CLYDE L. FREAR

Efficient Cupola Operation 89
Review of several basic interdependent conditions that are vital to the successful and efficient operation of the cupola—By T. H. BURKE

Controlling the CO_2 Process 94
Production problems can be lessened considerably by thorough investigation of a process before introducing it to production—By F. L. TURK

Permanent Mold Casting of Aluminum 98
Foundry has converted successfully from a sand casting to a permanent mold operation, and manufacturing economies have resulted—By C. B. CURTIS

Cost Accounting Procedures for the Gray Iron Foundry 103
Third article in series continues discussion of procedures to follow in setting up standards for the cost system—By ALBERT E. GROVER

OTHER FEATURES

Autoradiography Traces Additives in Metals By ROBERT H. HERRMANN .. 121
Steel Founders' Society T & O Conference 130
Proper Use of Cores Can Improve Production By C. A. PHALNIKAR 134
Man to Man By RALPH L. LEE 144
Making Sheaves by Stack Molding By ROBERT H. HERRMANN 150
Management's Responsibilities in Training By F. G. SEFING 155
Investment Casting Institute Fall Meeting By ROBERT H. HERRMANN ... 160
National Foundry Association Annual Meeting By FRANK G. STEINEBACH . 172
Meditations of a Sandman By HAROLD E. HENDERSON 178
Trouble Shooting By C. W. AMMEN 202
More on Silicon Determination By W. B. SOBERS 206
Mass Production Began in a Foundry By W. K. BOCK 214
Heating High-Bay Buildings By C. H. FOULDS 216

REGULAR DEPARTMENTS

Around the Country	166	Men of Industry	112
Calendar of Meetings	14	News Views	158
Foundry Developments	143	Obituary	213
Group Meetings	222	Questions and Answers	108
How To Do It	128	Readers' Comment	72
Industry Briefs	126	Statistics	185
Late News	33	The Shakeout	226
Literature for Foundrymen	190	With the Editors	10

Foundry Equipment and Supplies Digest 189

Business Staff—page 245 Classified Advertising—page 236 Advertisers' Index—page 245

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(For addresses of branch offices, see Page 245)

FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions, consultants, and research institutions where a direct foundry industry relationship exists.

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"NO AXE TO GRIND"

Making more than one type core?

Anxious to experiment with contemporary core making systems?

Want to speed up core production?

One "yes" is reason enough to ask your supplier of core binders whether he favors one system over another; whether he can offer binders for every core system – resin-bonded, air-set, CO_2 gassed, or oil bonded. Since the Archer Quality line has been expanded, ADM can supply superior binders for every core system. For the first time, we truly have NO AXE TO GRIND for any method in current use. For this reason, it might pay to call the Archer Representative in your area for a real shirt-sleeve discussion . . . or, if you prefer, write directly to ADM.

Archer-Daniels-Midland company

FEDERAL FOUNDRY SUPPLY DIVISION

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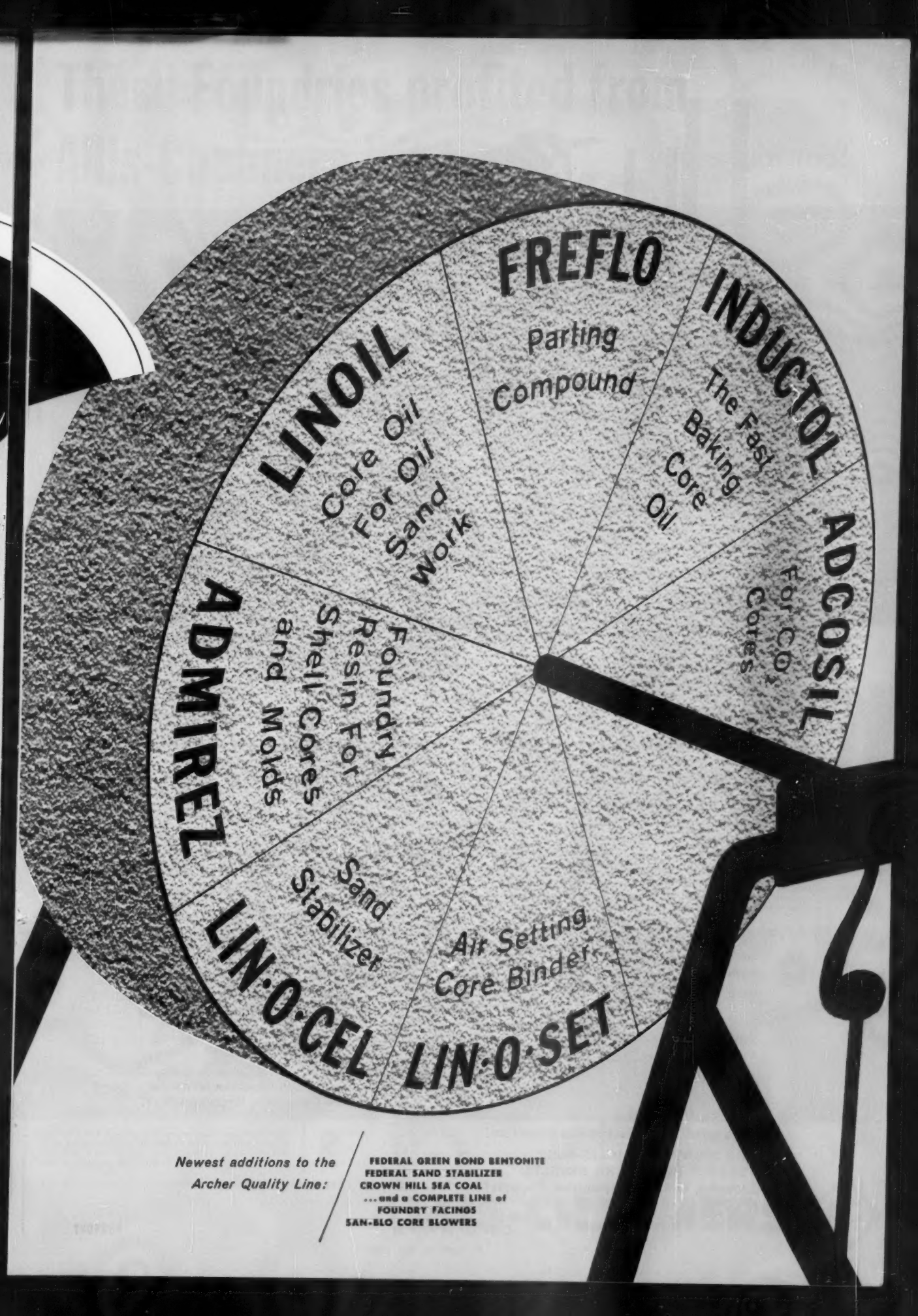
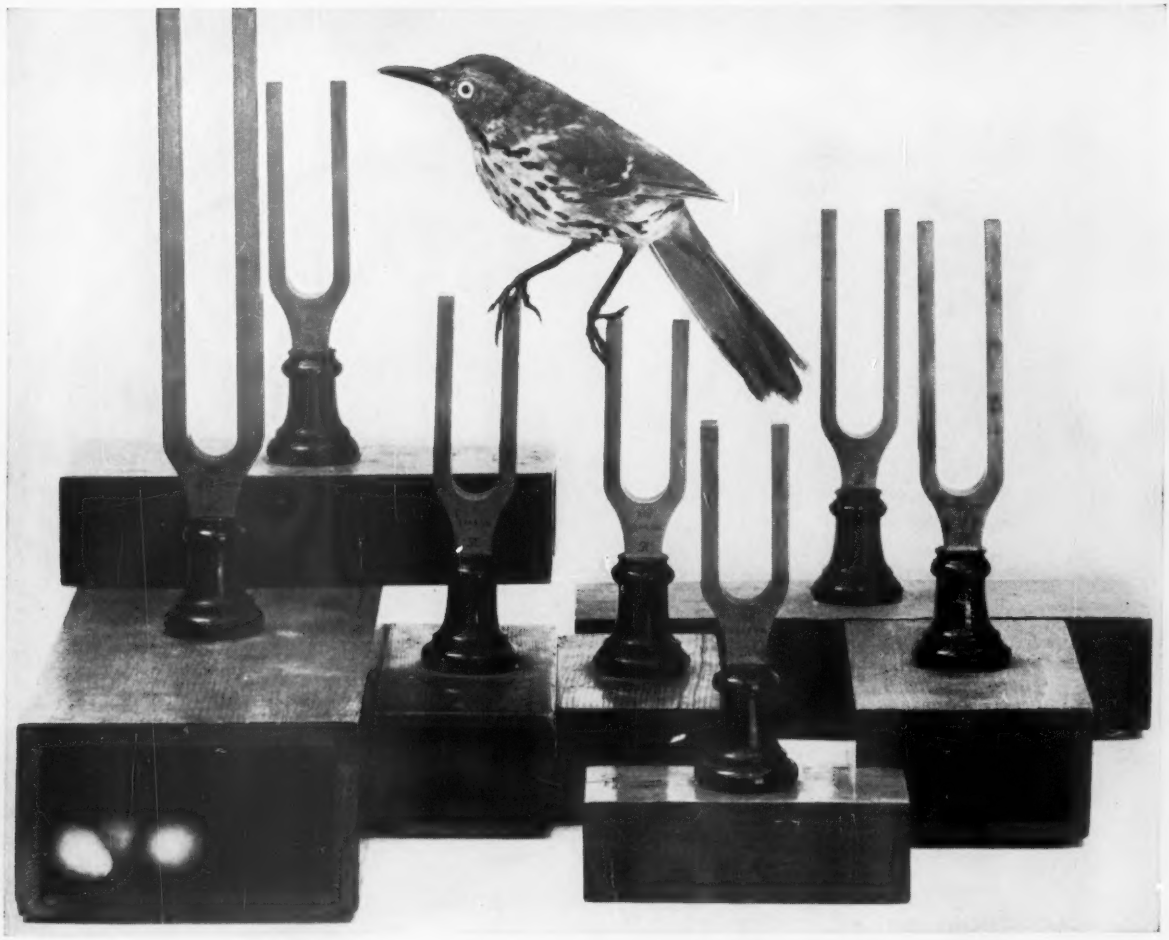
Circle 556 on Page 51



Newest additions to the Archer Quality Line:

FEDERAL GREEN BOND BENTONITE
FEDERAL SAND STABILIZER
CROWN HILL SEA COAL
...and a COMPLETE LINE of FOUNDRY FACINGS
SAN-BLO CORE BLOWERS



The tender touch of evaluation

Once, the testing and evaluation of industrial materials and products was anything but birdlike. To see if something worked, you often had to tear it apart.

Today, industry employs the tender miracle of *non-destructive testing:* radiography.

When it comes to testing industrial materials, more and more people are specifying Ansco X-ray Films—first films ever tailored especially for the needs of industry.

THE RIGHT FILM
FOR EVERY X-RAY NEED:

SUPERAY "A"
Versatile: A "workhorse" film!

SUPERAY "B"
Resolving power for research!

SUPERAY "C"
High speed for production-line inspection!

THE RIGHT CHEMICALS FOR
PERFECT PROCESSING RESULTS:
Liquadol, Liquadol Replenisher, Liquafix!

Ansco
X-ray

Ansco, A Division of General Aniline & Film Corporation, Binghamton, N. Y.

Circle 557 on Page 51

These Foundries profited from Allis-Chalmers lift trucks

yours can too!

Handling of materials offers some of the best opportunities open to foundries for cutting costs . . . since up to 150 tons must be moved to produce one ton of castings. Foundries everywhere have learned that an Allis-Chalmers lift truck is a *proved* way to cut costs on many handling operations.

See your Allis-Chalmers dealer soon. Have him give you the facts on lift trucks with capacities ranging from 2,000 to 10,000 lb — better still, ask him for a demonstration in your foundry.

MIDWEST — Material is handled more efficiently . . . less time is required with this Allis-Chalmers 6,000-lb lift truck. With rotating device, it handles foundry sand, other bulk materials.

WEST — Bundles of scrap are handled in the yard, moved to charging area with this 6,000-lb lift truck. The operator "spots" loads quickly because the truck maneuvers so easily in tight quarters.

EASTERN—On indoor or outdoor handling, this 4,000-lb lift truck works fast, drives easily, turns in 72-in. radius to move castings swiftly.

GREAT LAKES—Inventory was simplified—storage space better utilized because of tons-at-a-time tiering with this 6,000-lb lift truck. It also makes possible real savings on other handling.

NORTH — Over 6,000 hours of trouble-free operation with these Allis-Chalmers 4,000-lb lift trucks caused this foundry to add several more of the same trucks to their fleet.

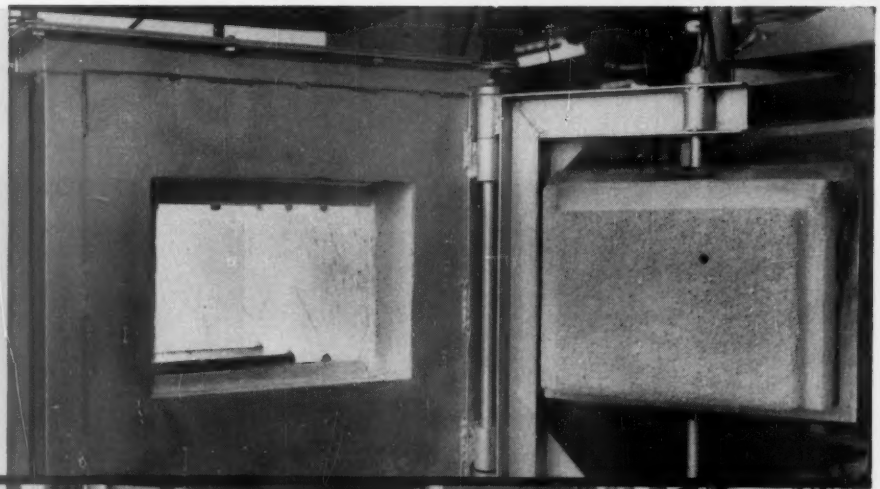
CENTRAL—Handling time was reduced 30% on materials moved by this and another Allis-Chalmers lift truck. They saved 90% of the time formerly required to unload refractory brick.

MATERIAL HANDLING DEPARTMENT, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

BH-61

ALLIS-CHALMERS

Circle 558 on Page 51



LINED WITH ALUNDUM 33-I CASTABLE, this furnace has been used for almost a year as a periodic furnace for high-temperature laboratory test work. During this time the door was opened and closed over a thousand times with the furnace at temperature. Even after this rugged service, the ALUNDUM Castable lining shows hardly any signs of wear.

LINED WITH A COMPETITIVE HIGH GRADE INSULATING BRICK, this similar furnace was used in the same service for an equal length of time. Under equally severe thermal shock conditions the lining cracked and spalled and this furnace must be rebuilt.

You get higher temperature protection with ALUNDUM* castables

Up to 3300° F!

ALUNDUM 33-I Insulating Castable is made up primarily of countless tiny, pure aluminum oxide bubbles. Forming a network of air spaces it provides excellent insulation, even at the highest commercial temperatures.

ALUNDUM 33-HD Heavy Duty Castable is chiefly composed of dense grains of pure aluminum oxide. It is recommended for forming dense monolithic surfaces in constructing many types of furnaces where high temperature conditions are more severe.

Both ALUNDUM 33-I and 33-HD Castables protect at temperatures up to 3300° F and are very easy to mix and use. You can cast simple or complex shapes with them quickly and inexpensively for many installations and replace more expensive pre-fired shapes.

See your Norton Representative for more facts on how these new Castables can provide long, trouble-free service that saves you time and money. Ask him for the folder *Two New Norton Castables*, or write for your free copy to NORTON COMPANY, Refractories Division, 300 New Bond Street, Worcester 6, Mass.

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Refractories • Abrasives
Grinding Wheels • Grinding Machines
BEHR-MANNING DIVISION PRODUCTS:
Coated Abrasives • Sharpening Stones
Behr-cat Tapes

Circle 559 on Page 51

Only COLEMAN TOWER® OVENS
provide all these major advantages

INCREASE PRODUCTIVITY

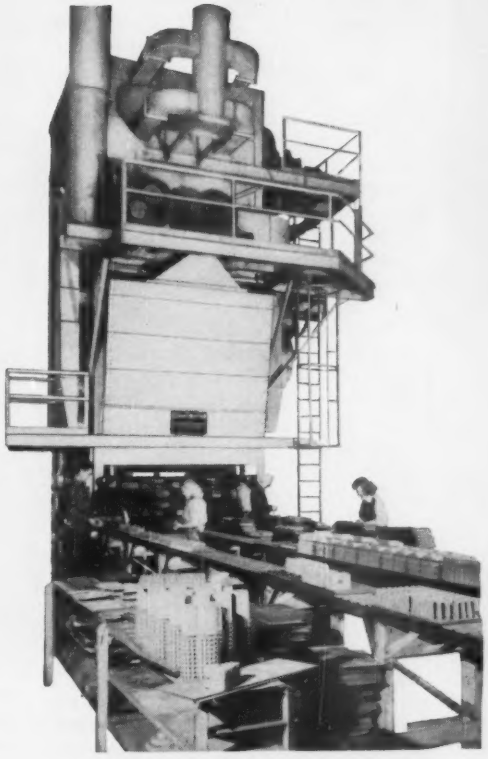
Savings through consistent, dependable production of perfectly baked cores; eliminating rejects, makeovers and casting losses due to improper core baking.

SAVE SPACE

Vertical design permits saving of approximately 75% of floor space over batch ovens of the same capacity. Cores are "smoked-off" and cooled before leaving unloading station.

REDUCE MAINTENANCE

Heavy duty construction for continuous, dependable performance and economical operation reduces maintenance cost to a minimum.



Coleman Tower ovens use only 25% of floor space required by batch type ovens of same capacity.

SAVE TIME

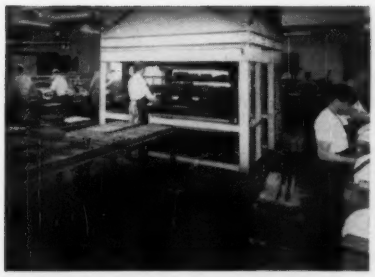
Cores of widely different sizes and shapes can be handled at the same time, all baked with consistent uniformity. Trucks, racks and money-wasting handling methods are eliminated.

SAVE BINDER

Proper core baking atmosphere and uniform temperature provide sizeable savings in conventional or high speed binders.

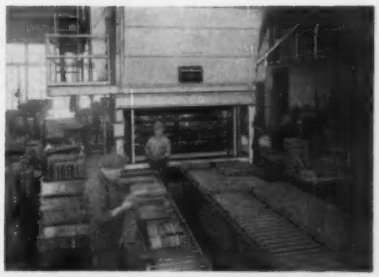
SAVE FUEL

The recovered heat is used over again, thus yielding important fuel saving. The most economical fuel available to you can be conveniently used.



Patented Open Center permits close, efficient grouping of coremakers around the oven... results in increased coremaker productivity.

3-way loading feature increases accessibility 300% over ordinary vertical oven designs.



Recuperative cooling system "smokes-off" and cools the cores before they reach unload station.

Coleman Tower Ovens are the most widely used continuous core baking ovens in the foundry industry. They have brought the advantages of mechanization to large and small foundries and have made important cost reductions. Why not find out whether Coleman Tower Ovens can bring the same savings to you? Our engineers are available without obligation to make practical recommendations for your particular requirements... call or write today!

WRITE FOR BULLETIN 54

A COMPLETE RANGE OF TYPES AND SIZES

for every core baking and mold drying requirement:

Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD **CLEVELAND 13, OHIO**

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

Circle 560 on Page 51

Imperial Hot Belt still going strong after 27,000 hours

The shakeout conveyor belt pictured above (236′ of 24″ x 5 ply) has already handled over 200,000 tons of red hot sprues and 300° to 400° sand for Briggs Manufacturing Co. It is still in excellent condition!

Unusual? Not for Imperial* Insulated Sahara* Belting, job-designed for the destructive high-temperature conditions of foundry service.

Job-designed belting. Imperial Sahara Belts are protected against heat damage by asbestos insulation and special impregnating compounds. Double-stitched, INNERLOCKED* construction positively prevents plies from separating.

Other Imperial Sahara Belts are designed to handle temperatures to 600°. To find out which Imperial Belt best fits your requirements, send for new Belting Catalog and Engineering Handbook.

*Reg. Trademark of Imperial Belting Co.

Imperial
BELTING COMPANY
1755 S. Kilbourn Ave., Chicago 23, Ill.

You expect MORE from Imperial ... and you get MORE!

Mail this coupon today for NEW Belting Catalog and Engineering Handbook

Name_____

Address_____

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Circle 561 on Page 51

With the Editors

STUDY of Shell Molding: The editors are making a study of the production of shell molded castings for presentation in an early 1958 issue. A questionnaire has been sent to all producers of shell molded castings.

It is the belief of the editors that the results of this study will prove beneficial to further progress in shell molding. Therefore, if you have a questionnaire which has not been returned to Cleveland with the requested information, will you please send it along at once?

—o—

Beaver! The Grinding Wheel Institute and the Abrasive Grain Association met in Chicago recently. The accompanying illustration shows the head table at the banquet when the dignitaries of both groups paid respects to the president of the institute, Paul Brown. As may be noted, the president startled the membership and guests with a magnificent new (genuine) Van Dyke beard and Menjou mustache grown while recuperating from an illness several weeks before the meeting. Reports indicate the luxurious foliage on the other gentlemen is phony.

Reading from left to right are Dr. Frank R. Henry, Simonds, Worden, White Co. and honorary president, GWI; Arthur T. Dalton, Chicago Wheel & Mfg. Co., and chairman, GWI; Paul B. Brown, Sterling Grinding Wheel Co. and Peninsular Grinding Wheel Div., Abrasive & Metal Products Co., and president, GWI; R. P. Harty, Exolon Co., and chairman, AGA; Robert C. Franklin, Macklin Co., and vice president, GWI; and W. B. Thomas, Hunter-Thomas Associates.

—o—

For Many Years: On Nov. 7 and 8, two major breaks in water mains on the west side of New York did much damage, flooded subways, and delayed 300,000 subway riders. The Manhattan newspapers all played the story, pointing out that it was cast iron pipe that broke.

A supplementary story in the *Herald Tribune* for Nov. 9, gave cast pipe a fair story. Under a heading "Main Break Always in Old Pipe," the article pointed out that the most frequent contributing cause is new construction nearby, or the proximity of a subway line. The two severe breaks on Nov. 7 and 8 were near construction sites. Some of the New York mains, it was pointed out, still date from the 1830s.

The last two paragraphs of the story leave some questions.

"Until 30 years ago the city used unlined cast-iron pipe exclusively, but the iron pipe now being installed is coated with a lining of cement. The "trunk" mains—those more than 20 inches—are now made of steel coated with a special tar. At first, all the joints, both longitudinal and circumferential, were riveted, now they are welded.

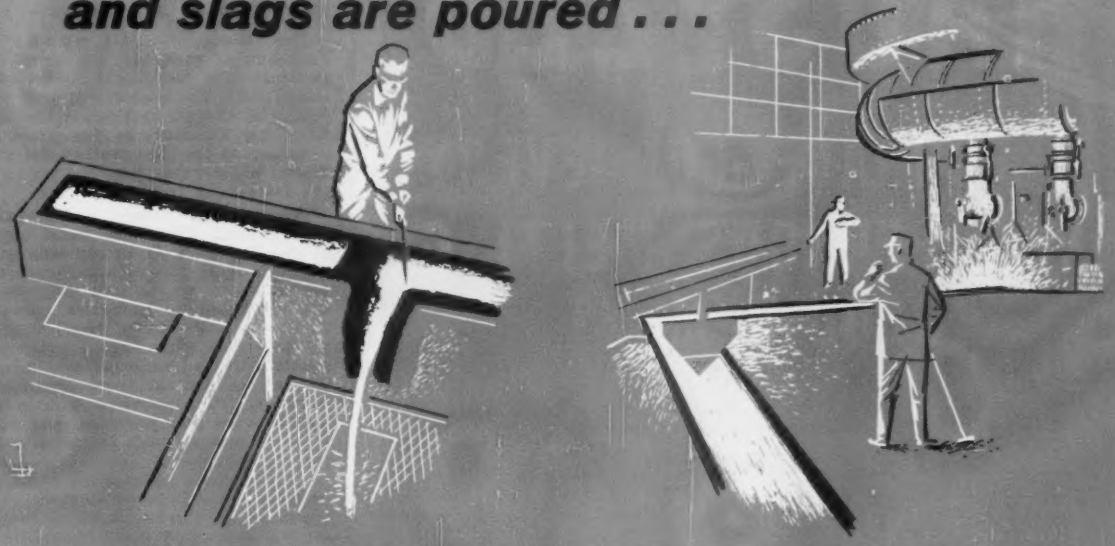
"Cast iron is still used in the smaller mains because it is the preferable material. It can be installed easier and faster and lends itself better to the multitude of branching pipes needed for servicing.

If cast pipe is better, why is fabricated pipe used for larger sizes?

—o—

Earlier than 1365: Here in the New World any organization connected with the foundry industry which traces its beginnings beyond 100 years is considered quite old. But in the Old World things are different. This fact was impressed on our editors quite forcibly when we read Vincent C. Faulkner's editorial in the

Used where metals and slags are poured . . .



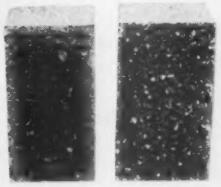
HARBISON-WALKER
BLACK PATCH
Plastic Graphite Refractory

- *reduces costs*
- *improves service*
- *assures cleaner metal*

Monolithic linings formed with H-W BLACK PATCH withstand severe corrosive and erosive action of various metals and slags, resist wetting and penetration and remain cleaner because there is less slag adherence.

When heated, H-W BLACK PATCH develops a strong ceramic set and a close texture which, together with the oxidation inhibitors, greatly retard burning of the carbon. In addition, the graphite component enhances the high resistance to thermal shock and increases the refractoriness of H-W BLACK PATCH.

NEW ZIP-OPEN CARTON aids in efficient handling of the plastic slabs. H-W BLACK PATCH is available in the form of plastic slabs 12″ x 9″ x 1″; in a compact mass in drums; or as a dry mixture in sacks, for mixing with water when used.



5-HOUR HIGH TEMPERATURE TEST SHOWS BLACK PATCH SUPERIORITY

Result of 5-hour test at 2730°F. Note difference in degree of oxidation. Test piece at left—ordinary graphite plastic; at right—H-W BLACK PATCH.

Some of the many important applications in which H-W Black Patch serves to advantage:

- HOLDING LADLES
- POURING LADLES
- BLAST FURNACE RUNNERS
- CUPOLA RUNNERS AND SPOUTS
- HAND LADLES
- CUPOLA TUYERE FACINGS
- MALLEABLE FURNACE RUNNERS AND SPOUTS
- CUPOLA IRON AND SLAG TAPPING HOLES

Another Quality Product of the World's Most Complete Refractories Service

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES

General Offices: Pittsburgh 22, Pennsylvania

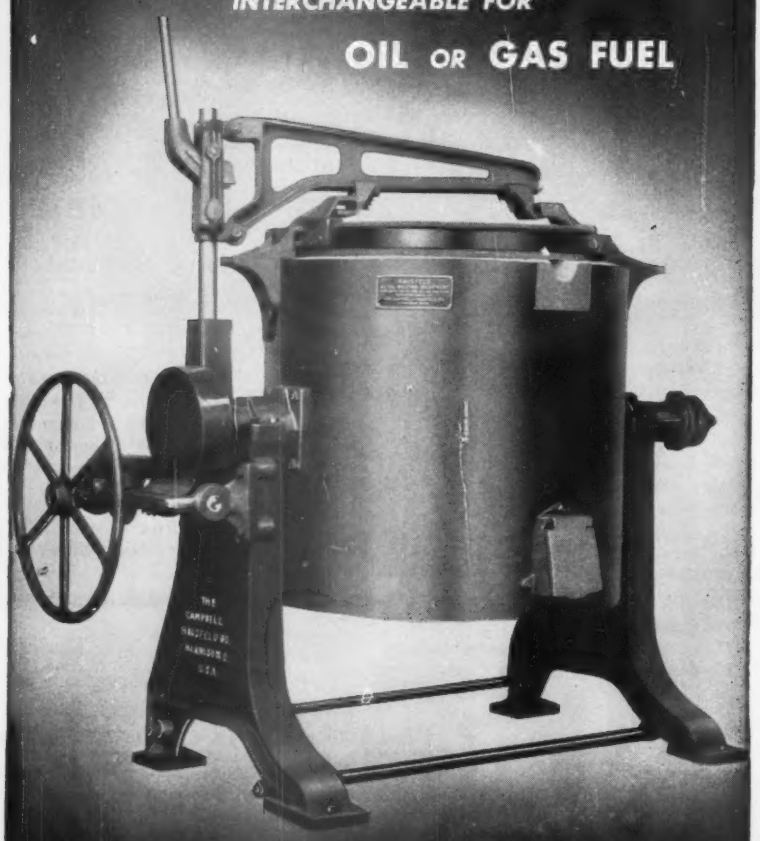
Circle 562 on Page 51

HAUSFELD

A FURNACE FOR EVERY NON-FERROUS MELTING REQUIREMENT

INTERCHANGEABLE FOR

OIL OR GAS FUEL



Built for Service

The Campbell-Hausfeld Co.

300-320 MOORE ST. HARRISON, OHIO

Oct. 17 issue of our esteemed contemporary, *The Foundry Trade Journal*, published in London, England.

I think you will be interested in the following comment on the Worshipful Company of Founders.

The Worshipful Company of Founders is probably the oldest organization in the world to be associated with the manufacture of cast products, though in France, the Syndicat des Fondeurs is the direct descendant of the Corporation des Fondeurs, which also had its origin in the mediaeval guilds.

When it was formed, at some time earlier than 1365, the main object of the Founders Company was quality control, and its establishment was probably due to the unwillingness of the staff of the foundries operated in the monasteries of the period to produce pots, pans, and similar productions for commercial and domestic use, as distinct from ornamental castings. The moulders among the monks were also jewelers, and made altar furniture, chefs (boxes for containing holy relics), and religious ornaments. Such craftsmen obviously preferred this type of work to repetition jobs. In those days, of course, cast iron was virtually unknown in this country.

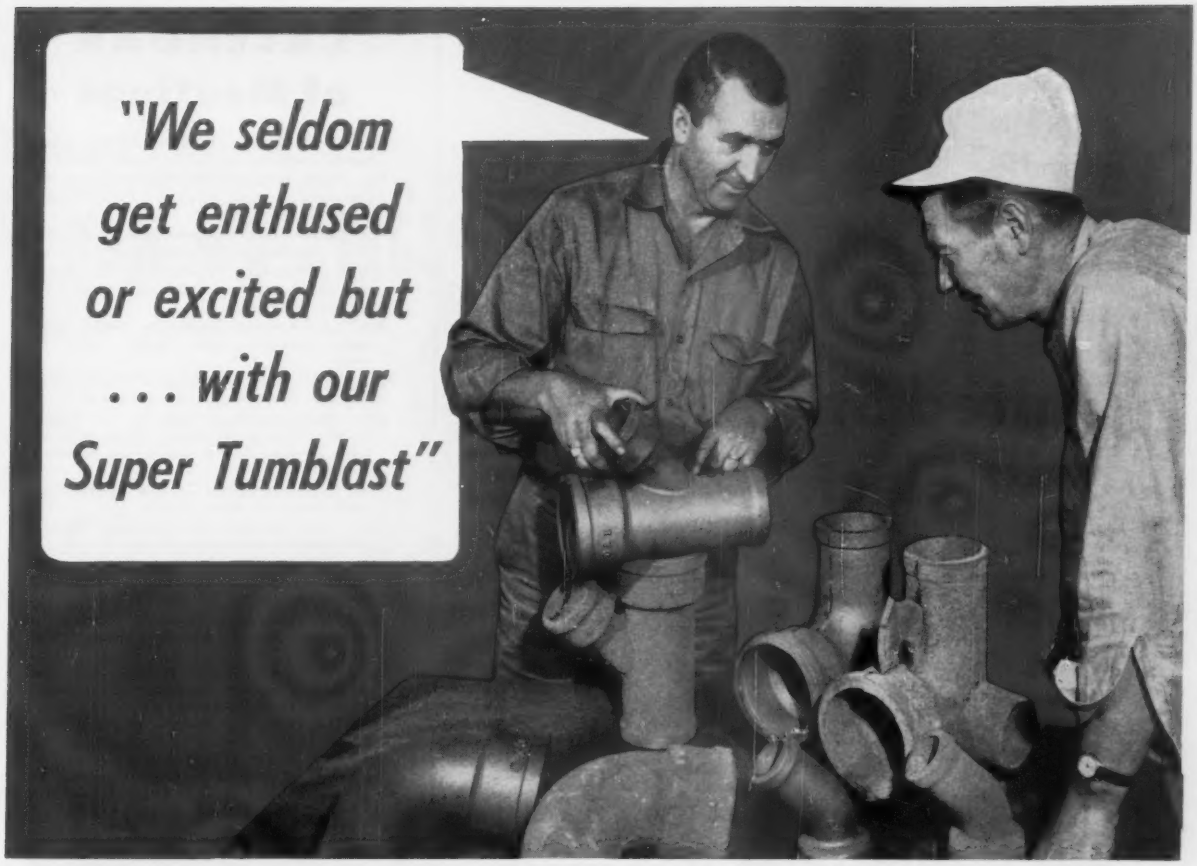
With the passing of the centuries, the character of the Founders Company underwent many vicissitudes of fortune, and by late Victorian days, the Livery, like most other Guilds, was mainly made up of gentlemen who actively associated themselves with the affairs of the City of London and its charities. The Founders Company, however, never lost interest in the crafts they represented. Just before the 1914 war, for example, it organized an exhibition and competition with the object of advancing the technology of the foundry industry.

About 20 years ago, the first of the modern generation of founders entered the Livery. Today, no fewer than a quarter of the Liverymen are actively engaged in the foundry industry in executive positions, and with every passing year, the ties with the industry have become strengthened.

Each year, Liverymen of the Company make a tour of foundries in different areas and acquire first-hand knowledge of the industry's aspirations and progress. The Company has helped practicing foundrymen in many ways, in particular in the supply of future technologists by the granting of scholarships enabling the recipients to travel abroad or study in an appropriate college.

Yet so far as customs and ritual are concerned, it zealously honors those procedures which have been passed down through the ages. It still possesses equipment for "size and stamping" nests of weights, a duty now undertaken by the Board of Trade. A beautiful Venetian glass goblet (a prize possession of the Company dating from 1527) is still used—filled with hippocras—by the retiring master, when presenting his successor to this high office. The foundry industry is indeed proud of this most ancient of its organizations.

F.G.S.



Wahkonsa Foundry Co. Says:

"We have every right to get excited with our Wheelabrator Super Tumblast because we are now cleaning 2400 pounds of castings in the time it took to clean 1200 pounds before! In terms of man hours, we have reduced our cleaning time on pipe fittings 50%!

"Another thing that impresses us is that we are doing a much better job of cleaning than formerly so we are able to offer a much better quality product than we did in the past. The Wheelabrator Super Tumblast has enabled us to cut our cleaning time on both our pipe and fittings from a 24 hour per day job to a 16 hour per day job."

The way F. W. Dennis, manager of the Wahkonsa Foundry Company, Des Moines, Iowa, expressed enthusiasm for the performance of their Wheelabrator Super Tumblast is similar to many other testimonials received from foundries using this airless method of batch type blast cleaning. Wheelabrator Super Tumblast cuts costs in every foundry cleaning problem. To learn how you, too, can make super savings, write for Bulletin 145-D.

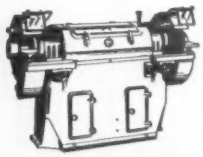
WHEELABRATOR

CORPORATION

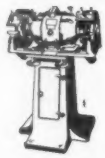
505 South Byrkit Street, Mishawaka, Indiana

World's Largest Manufacturer of Airless Blast Cleaning Equipment

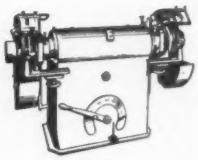
Circle 564 on Page 51



BELT DRIVE

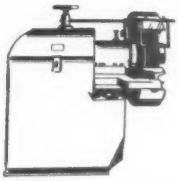


DIRECT DRIVE



GEAR DRIVE

United States Electrical Tools



VARI-SPEED SINGLE OR DUAL

SWING FRAME

PORTABLE 1/3 hp to 7½ hp

Over 60 Years of Service to Industry

GRINDERS AND DRILLS

Electrically and mechanically correct. All rotating parts and spindles are precision-balanced dynamically by latest electronic equipment.

Attractively priced.

Performance plus remarkable savings in time and costs—as well as minimum maintenance—these are features to assure your satisfaction.

Precision-engineered and crafted for maximum endurance under exacting conditions . . . tools to speed production or for plant purposes.

WRITE FOR CATALOG

The United States Electrical Tool Co.
3640 LLEWELLYN ST., CINCINNATI 23, OHIO

CALENDAR of Meetings

Jan. 17—Malleable Founders' Society, semi-annual meeting, Hotel Cleveland, Cleveland.

Jan. 27-28—Industrial Heating Equipment Association, annual meeting, Penn-Sheraton Hotel, Pittsburgh.

Jan. 27-30—Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

Feb. 6-7—Malleable Founders' Society, technical and operating conference, Wade Park Manor, Cleveland.

Feb. 9-14—American Society for Testing Materials, committee week, Statler Hotel, St. Louis.

Feb. 13-14—Wisconsin Regional Foundry Conference, Hotel Schroeder, Milwaukee.

Feb. 16-20—American Institute of Mining, Metallurgical & Petroleum Engineers, annual meetiing, Hotels Statler and Sheraton-McAlpin, New York.

Feb. 18-20—Investment Casting Institute, annual meeting, New York.

Feb. 20-21—Southeastern Regional Foundry Conference, Chattanooga, Tenn.

Mar. 12-13—Foundry Educational Foundation, college-industry conference, Hotel Statler, Cleveland.

Mar. 17-18 — Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

Apr. 21-23—Association of Iron and Steel Engineers, spring conference, Dinkler-Tutwiler Hotel, Birmingham, Ala.

May 1-8—American Society of Tool Engineers, annual meeting and convention, Convention Center, Philadelphia.

May 8-10—American Material Handling Society, western regional material handling show Great Western Exhibit Center, Los Angeles.

May 12-16—American Society for Metals, 1st southwestern metal congress and exposition, Automobile Bldg., Dallas, Tex.

May 19-23—American Foundrymen's Society, 62nd annual convention and exhibition, Public Auditorium, Cleveland.

May 21-22—American Iron & Steel Institute, annual meeting, Waldorf-Astoria Hotel, New York.

June 9-11—Malleable Founders' Society, annual meeting, Homestead, Hot Springs, Va.

June 9-12—National Materials Handling Exposition, Public Auditorium, Cleveland.

June 9-13—International Automation Exposition and Congress, Coliseum, New York City.

June 12-13—American Foundrymen's Society, annual chapter officers conference, Hotel Sherman, Chicago.

June 19-21—American Foundrymen's Society, foundry instructors seminar, Case Institute of Technology, Cleveland.

June 22-27—American Society for Testing Materials, annual meeting, Statler and Sheraton-Plaza Hotels, Boston, Mass.

Sept. 15-19—Instrument Society of America, annual instrument-automation conference and exhibit, Convention Hall, Philadelphia.

Sept. 22-23—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 23-26—Association of Iron and Steel Engineers, annual meeting, Public Auditorium, Cleveland.

Oct. 8-10—Gray Iron Founders' Society, annual meeting, Sheraton Park Hotel, Washington.

Oct. 16-18—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 18-21—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

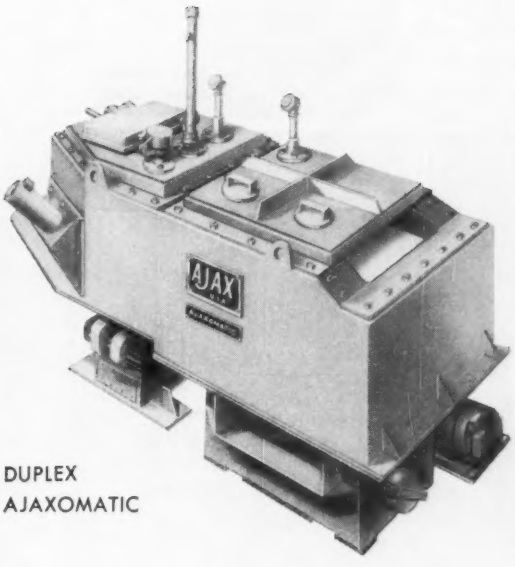
Oct. 27-31—American Society for Metals, national metals exposition and congress, Public Auditorium, Cleveland.

Nov. 10-12—Steel Founders' Society of America, technical and operating conference, Carter Hotel, Cleveland.

CAN WE STILL AFFORD HAND-LADLING?

AJAXOMATICS

bring automation to die casting



DUPLEX
AJAXOMATIC

The Duplex AJAXOMATIC melts aluminum pig and gates right at the die casting machine. By pushing a button the operator initiates the complete casting cycle: the die closes and the Duplex AJAXOMATIC pours the exact required amount of molten metal directly into the cold chamber. The operator just removes the finished casting at the end of the cycle.

Automation, however, is only part of the AJAXOMATIC story. The Duplex AJAXOMATIC also gives assurance of consistent quality. The quality of a finished casting begins with the proper melting of the metal. 60 cycle induction with its two basic features of internal heating and electromagnetic stirring is used exclusively in the Duplex AJAXOMATIC. Here are the unique characteristics of the Duplex AJAXOMATIC:

Precision temperature control — at low temperature	No supply ladle system or hand ladles
Alloy uniformity — no segregation	Precise weight of automatic pour
No gas porosity	Comfortable working conditions
Low metal loss	Low maintenance

The standard Duplex AJAXOMATIC is rated 120 kw to produce 500 lbs per hour of castings ranging from ½ lb to 30 lbs. Other AJAXOMATICS are available to suit a wide range of production requirements, including units supplied from central melting systems. May we have an opportunity to study your requirements?

AJAX USA

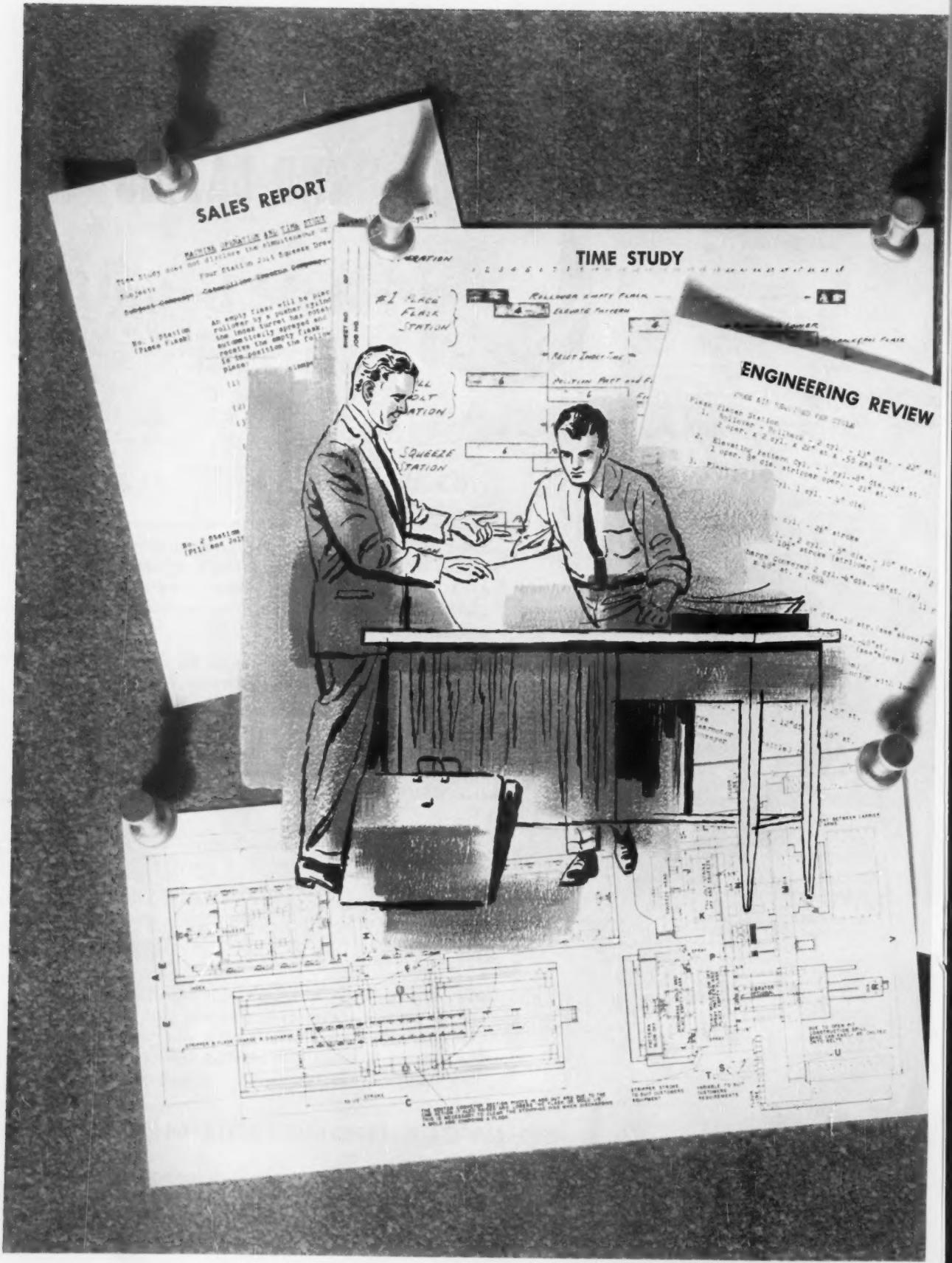
60 CYCLE INDUCTION MELTING

ENGINEERING CORPORATION

TRENTON 7, NEW JERSEY

Associated Companies: Ajax Electrothermic Corporation Ajax Electric Company

Circle 566 on Page 51


SALES REPORT
TIME STUDY
ENGINEERING REVIEW

they've made their way... by the way they're made

The statement above applies to our complete line of 11 different molding machines, designed to fit all foundry operations.

It typifies the manner in which we have gone about the business of building molding machines, for more than a half century.

A Herman Molding Machine has an added measure of value to its owner which didn't just happen. This extra quality, giving our machines the longer life and more rugged cycle of duty for which they are famous, is compounded basically from outstanding and unusual engineering.

We call it *liaison engineering,* and it's made up of a unique relationship between our Engineering Department at the Zelienople, Pa., plant and our sales representatives in the field.

Practical information about the requirements of our customers, flows steadily back and forth between our men who are on-location with foundrymen in their plants and engineering specialists in *our* plant.

This relationship is close, personal and effective. It has resulted in the manufacture of molding machines second to none in performance, quality production and fast amortization.

This liaison between theoretical engineering, sales, and service, has led inevitably to the building of practical machines that foundrymen need and want.

So whether it's an initial time study, engineering department review, assembly drawing and final testing . . . *all* of our engineering procedures serve to demonstrate, time and time again, that Herman Molding Machines *Have Made Their Way By The Way They're Made.*

Other reasons for the superior quality of our machines will be discussed in future advertising.

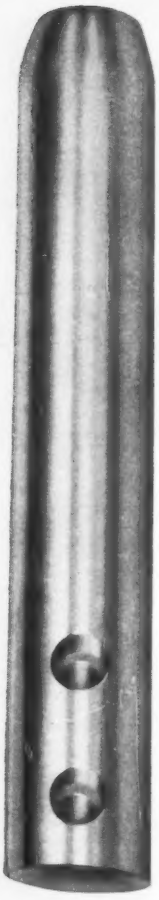
Watch for it....

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HERMAN

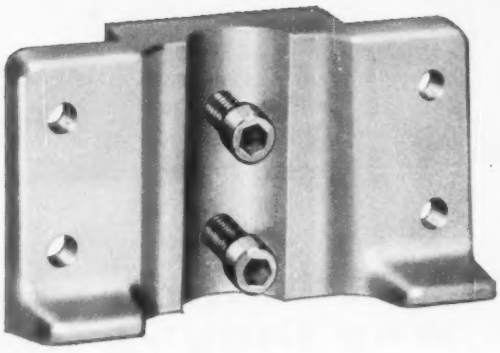
Best Known Name in Molding Machines

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.



ADAMS 1" ROUND PIN

Side Mounting—Reversible
Countersunk Both Sides
Hardened—Ground
Hard Chrome Plated

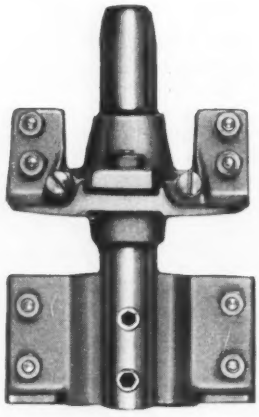


ADAMS 1" ROUND PIN BASE
(Cast Aluminum)

For Side Mounted Reversible Pins
Pins Mounted with Allen
Hollow Head Set Screws

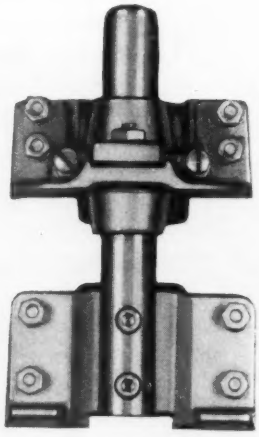
ADAMS MATCH PLATE EAR

Extra Long for
1" diameter Pins
(Side Mounted)



ADAMS 1" ROUND PIN AND EAR
(For Cherry Flasks)

Side Mounting Permits Use of
Extra Long Match Plate Ear Assuring Expert Deep Pattern Draw



ADAMS 1" ROUND PIN AND EAR
(For Aluminum Flasks)

Side Mounting Assures Rigidity
of Pin. Adds Extra Life Because
of Simple Reversible Feature

1883—ADAMS QUALITY AND PRECISION—1958

Adams Quality and Precision remains constant through rigid specifications governing the manufacture of all New Flask Equipment or Flask Trimmings to be used for Part Replacement. Write us today. Your equipment problems can be solved by Adams.

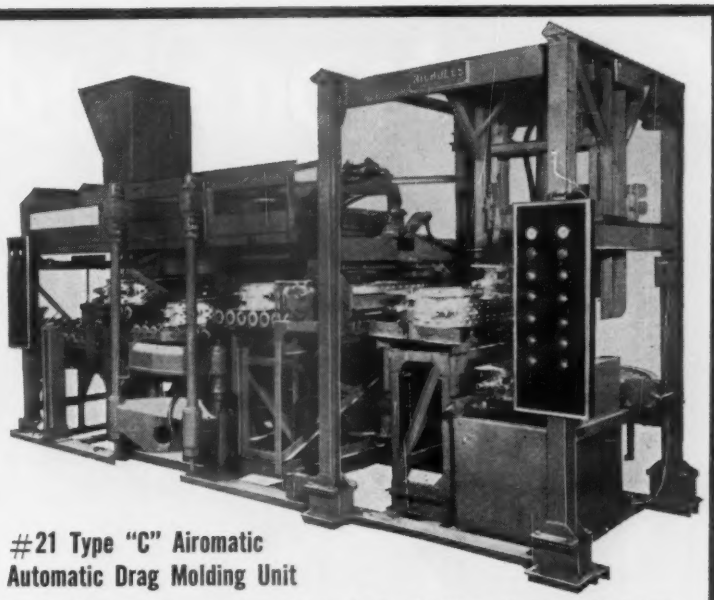
The ADAMS Company

Dubuque, Iowa

1883 75 years of progress 1958

Circle 568 on Page 51

- **INCREASE** production . . .
- **SAVE** manhours . . .
- **GET** quality molds with the new



#21 Type "C" Airomatic Automatic Drag Molding Unit

Heavy Duty Jolt & Power Squeezer Drag Molding Machine with Pneumatic Pattern Draw. Equipped with air operated car type squeeze head and built-in flask roll-in and mold roll-out device with measuring sand hopper, flask indexing device and sand spill upset, flask feed-in elevator, mold turn-over and mold transfer.

NICHOLLS AIROMATIC

Nicholls has harnessed this molding machine's own driving force **airomatically** to give you a **better** job at **less** cost. There are no limit switches, no electrical timers, no electric pressure switches, no electrical latch relays, just **dependable,** reliable "push-button" air-to-air control throughout.

Yes, the new NICHOLLS AIROMATIC molding equipment makes, closes, removes and returns **consistent high-quality** molds **continuously . . . automatically.** It represents the acme of simplicity for the automatic production of high quality and high quantity mass produced sand molds.

Check **your** equipment **today.** Whatever your system, there's a Nicholls machine to fit the job. For information call or write

WM. H. NICHOLLS CO., INC.
Richmond Hill 18, Long Island, N. Y.

Compare this... with your present equipment

Can You

1. Push your "Stop" button and then after a pause, push your "Start" button and have your equipment continue with the next phase?
2. Push your "Stop" button and then after pushing several "Manual" buttons for subsequent phases, push the "Start" button and have your equipment continue automatically with the next phase?
3. Use a particular "Manual" button to pinch-hit in an emergency for a failed automatic phase in finishing out a molding shift?
4. Get 240 molds per hour (one every 15 seconds) hour after hour, shift after shift, day after day?

You CAN with a NICHOLLS AIROMATIC!

NICHOLLS

• FOR HALF A CENTURY THE BEST IN MOLDING EQUIPMENT

Experts on sand agree...

OTTAWA'S BEST

99.89% PURE

Laboratory tests prove Ottawa Silica 99.89% pure.

Serviced by two main trunk railway systems, Ottawa offers fast delivery to all corners of the nation.

Right from the beginning—over fifty years ago—Ottawa Silica Sands were best. This isn't hard to understand when you know that these sands come from one of the finest natural deposits in the world. Painstaking cleansing and classifying processes in Ottawa's big modern mills add the finishing touches to their supreme quality.

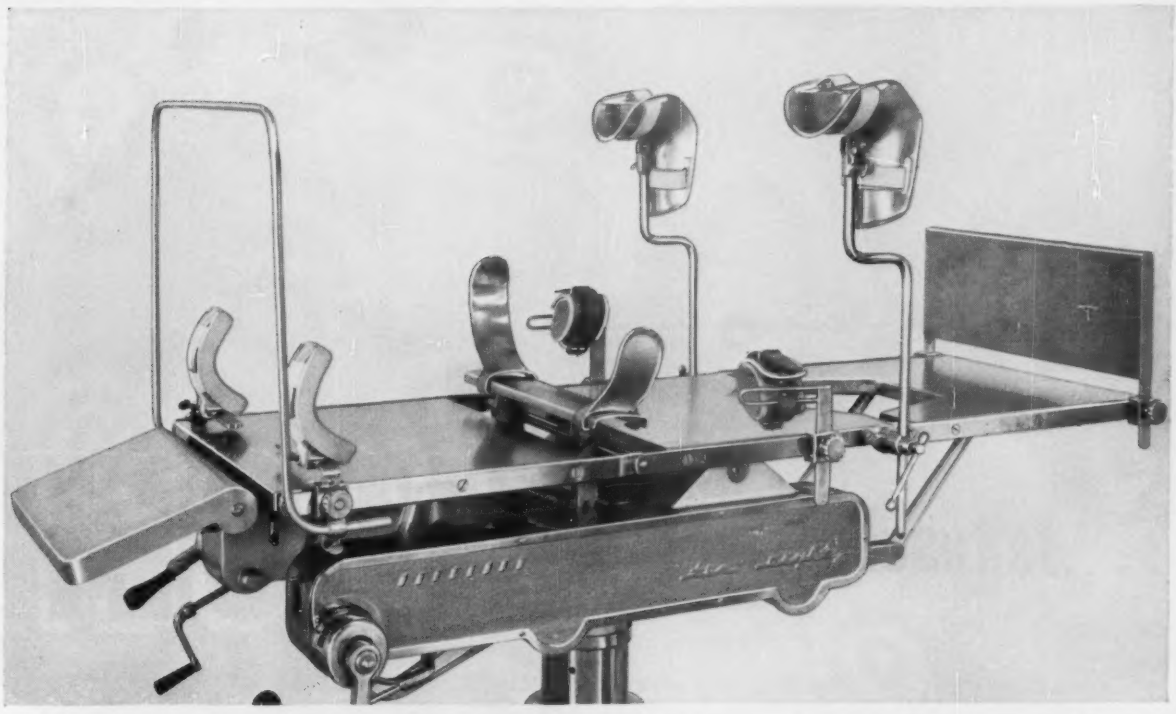
For best foundry products, order the best silica products —order from Ottawa.

OTTAWA SILICA COMPANY

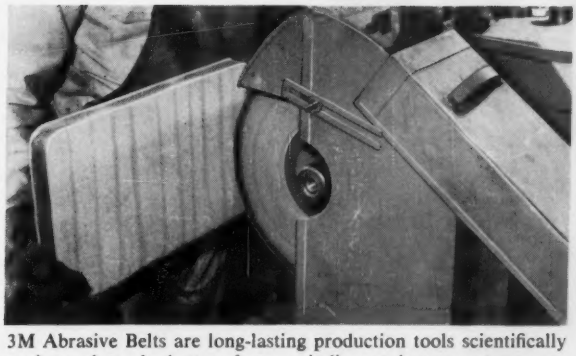
PLANTS LOCATED IN
OTTAWA, ILL. AND ROCKWOOD, MICH.

SERVING THE FOUNDRY, GLASS AND CERAMIC INDUSTRIES FOR OVER 50 YEARS

3M METHOD–better from start to finish



3M Abrasive Belts increase production 25% on finishing of surgical table parts



3M Abrasive Belts are long-lasting production tools scientifically engineered to do better, faster grinding at lower cost to you.

American Sterilizer Co., Erie, Pa., made this saving when they switched to the Abrasive Belt Method for removing nibs, burrs and other imperfections from brass and aluminum castings. This company formerly used set-up wheels – a slow, costly method. When they switched to the 3M Method using Three-M-ite Resin Bond Cloth Belts, production on all the above castings jumped 25% with far superior pre-plating finishes. The 3M Method can help *you* increase production and cut costs in *your* foundry. Call your 3M Representative *today* or send coupon below.

3M ABRASIVES

Send today for FREE Booklet:

MINNESOTA MINING AND MANUFACTURING CO.
Dept. CN-18, St. Paul 6, Minn.

☐ Send me free booklet: "Grinding & Finishing Non-ferrous Metals with 3M Abrasives"

☐ Please have 3M Representative call

*Name*_____ *Title*_____

*Company*_____

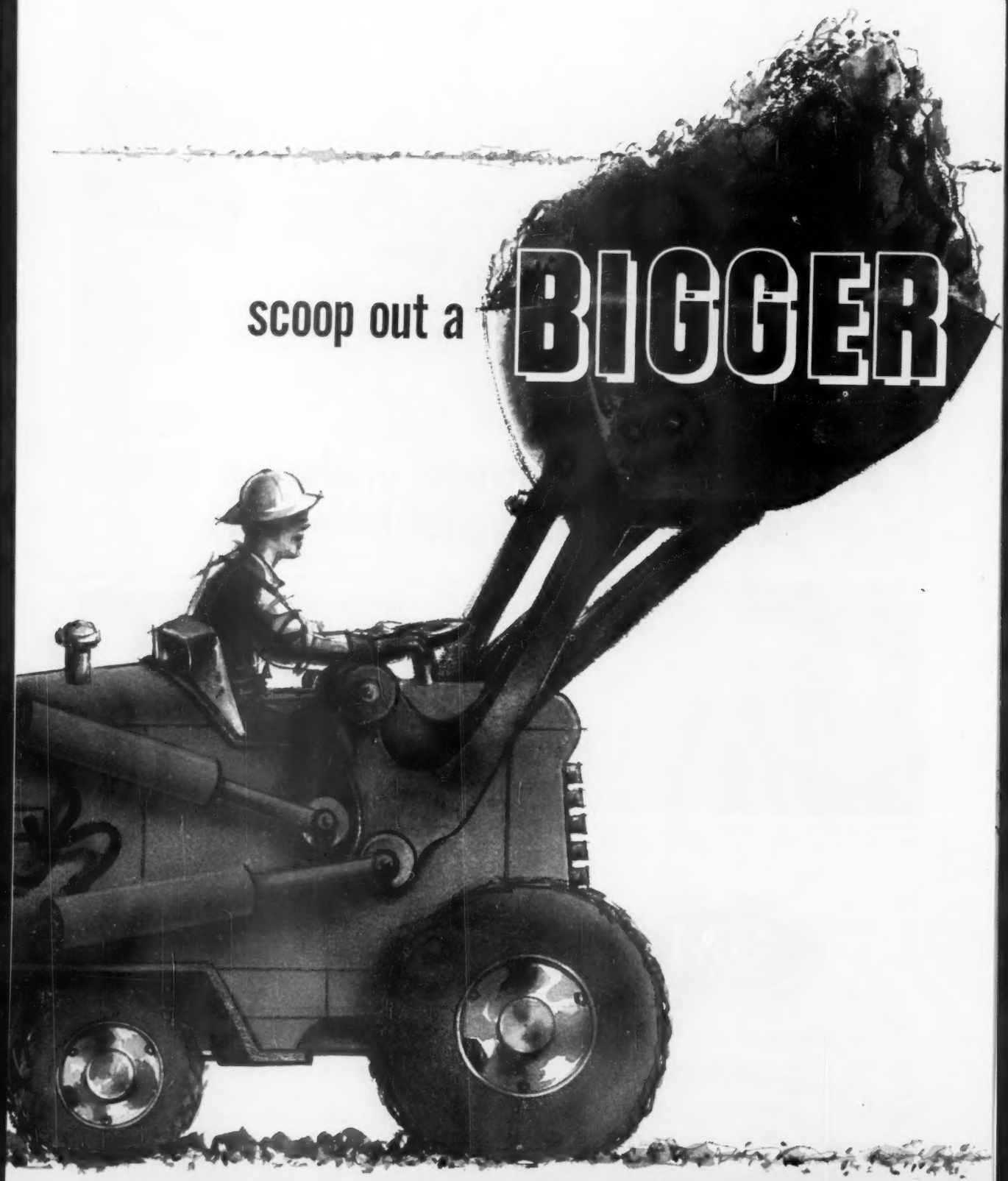
*Address*_____

*City*_____ *Zone*____ *State*_____

Made in U.S.A. by Minnesota Mining and Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City.

PRODUCT OF 3M COMPANY RESEARCH

Circle 571 on Page 51


scoop out a
BIGGER

share of this FOUNDRY market . . .

Now's the time to move forward!

Foundries spend more than $10½ million a day for equipment and supplies.

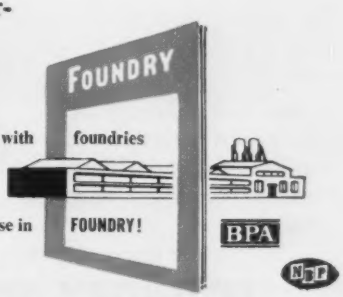
There's never been more potential for increased sales volume in this market. Extra sales have seldom been more promising than right now—because applying the needed effort is so simple.

You start with a *full* schedule in FOUNDRY—basic because it reaches every known buying influence in every foundry employing 20 or more and 96% of all others.

Our exclusive PLUS-5 Sales Development Service takes you straight to the heart of your market—person to person. You work with a complete advertising-sales package that does a selling job on foundries alone. Nothing sells foundries like FOUNDRY.

Your request will bring complete information promptly.

You do more business with foundries when you advertise in FOUNDRY!



a PENTON Publication / Penton Building, Cleveland 13, Ohio

Circle 572 on Page 51

YOU'LL DO A BETTER JOB

with **H. V. ADAMS DESIGNED**

HIGH EFFICIENCY FOUNDRY TOOLS

"UNIVERSAL FREE WHEELING"

FOUNDRY SAND RIDDLE

with the Double Eight Vibration

Because of its convenient size, light weight and good riddling capacity it long has been a favorite in the foundry. It also can be used for mixing core sand or for sifting sand directly into molds.

The mechanism is entirely enclosed protecting it from harmful dust and grit.

The main frame is cast in very strong tough aluminum.

It uses quick change ferruled sieves with 20 in. diameter sifting area. There are no loose wires to harm hands.

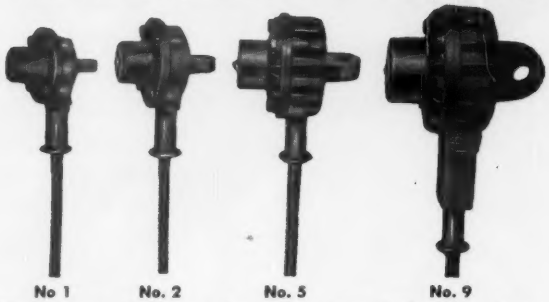
THE "ROTOPLANE" SPEED SIFTER

WILL GIVE YOU

- **SPEED**
- **ECONOMY**
- **SAFETY**
- **LONGER LIFE**
- **GREATER SIFTING CAPACITY**

Its sturdy one-piece frame and long shaft add to vibration effectiveness. The sealed-in mechanism assures protection of motor and bearings from exposure to dust and grit. This sealed in protection and "Rotoplane's" free-rotary action vastly increase bearing life. No exposed moving parts endanger the operator. Sieves have 20 inches diameter clear sifting area—are mounted in a smooth steel ferrule with no jagged edges to cause dangerous cuts and scratches.

"RED (Devil) ELECTRIC" VIBRATORS



No 1 No. 2 No. 5 No. 9

These hard hitting Adams designed Vibrators have served the foundries for over 30 years. They are provided with a 6 foot 3 wire authorized cable and 3 wire grounded connector which, when connected with our 3 wire grounded Red Electric Knee Switch, automatically grounds the vibrator protecting the worker from shock. The vibrators have passed the U. S. Government code inspection.

Other Foundry Products:

- **No. 11 NOISELESS TYPE VIBRATOR**
- **A-20 ELECTRIC VIBRATOR**
- **RED ELECTRIC KNEE SWITCHES**
- **"ROTO" ADJUSTABLE BIN VIBRATOR**
- **2 MIN. UNIVERSAL FINENESS TEST SIFTER.**
- **UNIVERSAL TRIPOD CARRIER**

ORDER ALL SIFTERS AND VIBRATORS WITH GROUND WIRE!!

FOUNDRY SUPPLIES MANUFACTURING CO., NOT INC.

2221 Orchard Street - Chicago 14, Illinois

Established 1918 **Cable Address: "Rotoplane Chicago"** **H. V. ADAMS, Mgr.**

HANDY SANDY...

beats a tough assignment in a prominent steel foundry

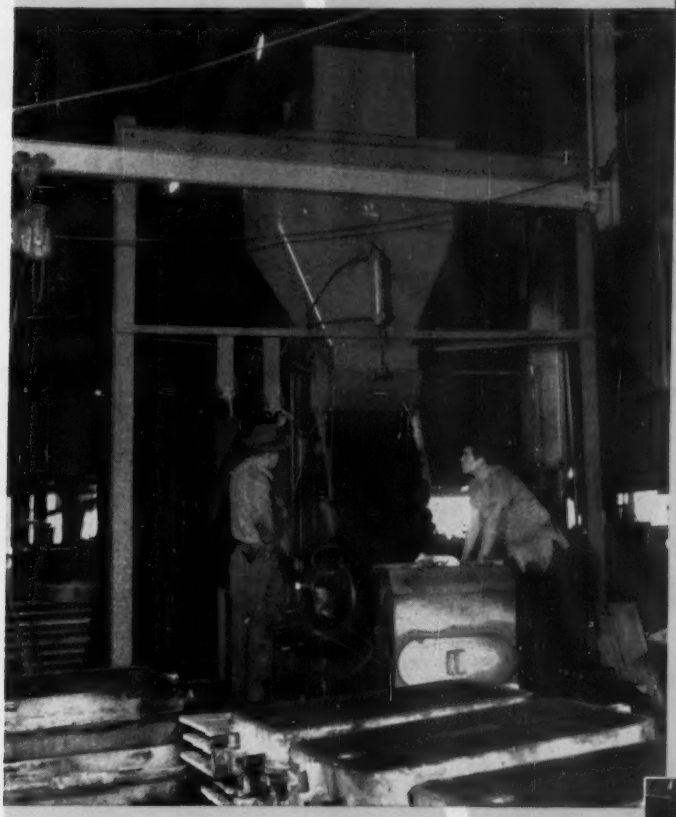


Photo above shows one of the Handy Sandys that provides sand for a large roll over machine.

Photo at right shows one of the Handy Sandys that provide overhead sand for a Cope and Drag operation. With this set-up three men are doing the work of four, and are producing 25% more molds per hour at a large reduction in molding costs.

Newaygo Handy Sandys are a "natural" for steel foundry molding operations. They are engineered like most Newaygo Foundry Equipment — to do a specific job, and do it better.

In this case, these special designed Handy Sandys include as standard equipment Belt-Type Elevators and a special Discharge Baffle on the elevator head to prevent sand from sticking at the discharge point. The overhead Aerator also has separate motor drives to give increased speed as well as aeration to the sticky sand. Removable, hardened aluminum lining is standard in the Overhead Hopper to assist proper flow of sand through the gate.

The two Handy Sandys in this foundry have been in operation for over six months. No trouble of any kind has been experienced in handling the sticky sand. No appreciable amount of maintenance has been required.

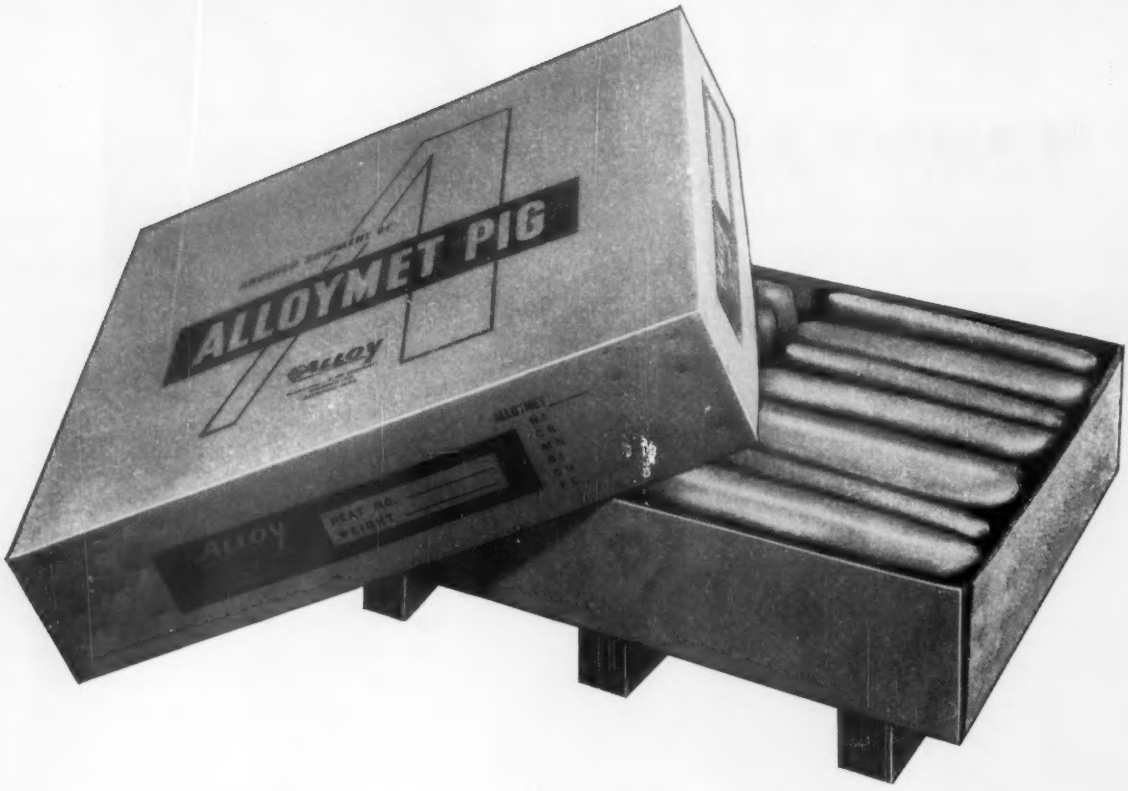
*"Foundry Business is **BIG** Business"*

Send for your copy of "Planned Mechanization for Foundries."

NEWAYGO engineering company
NEWAYGO, MICHIGAN

...and profitable too, with NEWAY® MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT

Circle 574 on Page 51



no unknowns here to contaminate your alloy heats

In raw materials, this is as far as you can get from the contamination hazard present in loose or bundled nickel scrap.

It's as close as you can get to perfection . . . weight and certified analysis in plain view at all times . . . an all fiberboard palletized package ready to go into the electric furnace — without opening.

This sturdy lightweight carton not only saves on shipping costs, but reduces the chance for pilferage as well. Easily stored and handled, too — measures only 29 by 39 inches across, and 11 inches high, including the standard three-inch pallets.

If you are still using loose or bundled scrap for your alloy requirements, ask us about the advantages of using Alloymet* pig and shot of certified analysis.

*Alloymet alloys are available in a complete range of nickel chrome, nickel iron and nickel copper analyses.

ALLOY METAL PRODUCTS, Inc.
PHONE 6-2561 • TELETYPE DV 588
(FORMERLY A DIVISION OF **ALTER COMPANY**)
ROCKINGHAM ROAD
DAVENPORT, IOWA

World's largest producer of secondary nickel alloys of certified analysis

Circle 575 on Page 51
Circle 576 on Page 51→

ENGINEERING

Engineering specialists are available to assist with pattern design and development.

WOOD PATTERN SHOP

Skilled craftsmen, modern woodworking tools combine to produce accurate masters.

FOUNDRY

The latest electric furnaces, controls and methods insure the very finest pattern castings.

A *Complete* SERVICE...

METAL PATTERN SHOP

Experienced metalworking personnel carefully pilot patterns through each operation.

MACHINE SHOP

An efficient machine shop provides complete facilities for all pattern machining needs.

LABORATORY

Laboratory "in process" control and inspection insure consistent quality standards.

...FROM BLUEPRINT TO PRODUCTION PATTERN

That's right! City Pattern Foundry and Machine Company is equipped with the modern, efficient machinery and staffed with the skilled, experienced personnel to offer you a complete, "start to finish" service on *all* your pattern requirements. Now, obviously, from the standpoint of convenience alone, it pays to have all phases of your pattern development and production under one roof. But convenience, though important, is actually just a "fringe benefit" of City Pattern Foundry and Machine Company service. More important . . . and the reason why so many leading manufacturers rely on our pattern making facilities and knowledge . . . is the fact that our entire operation is geared to combine uncompromising accuracy with maximum efficiency. The result . . . over a period of more than 40 years . . . has been patterns of the finest possible quality at the lowest possible cost.

And that's not all! We're well equipped to serve you in a number of other ways, too. Our foundry department, for example, is one of the most modern and versatile in this section of the country for experimental or production castings, for high conductivity copper, copper alloy, brass and aluminum castings. What's more, City Pattern Foundry and Machine Company offers you complete facilities for fast, accurate, economical machining and fabricating. Want detailed information? Write or call today.

CITY PATTERN

FOUNDRY AND MACHINE CO.

1161 HARPER AVE. • DETROIT 11, MICH.

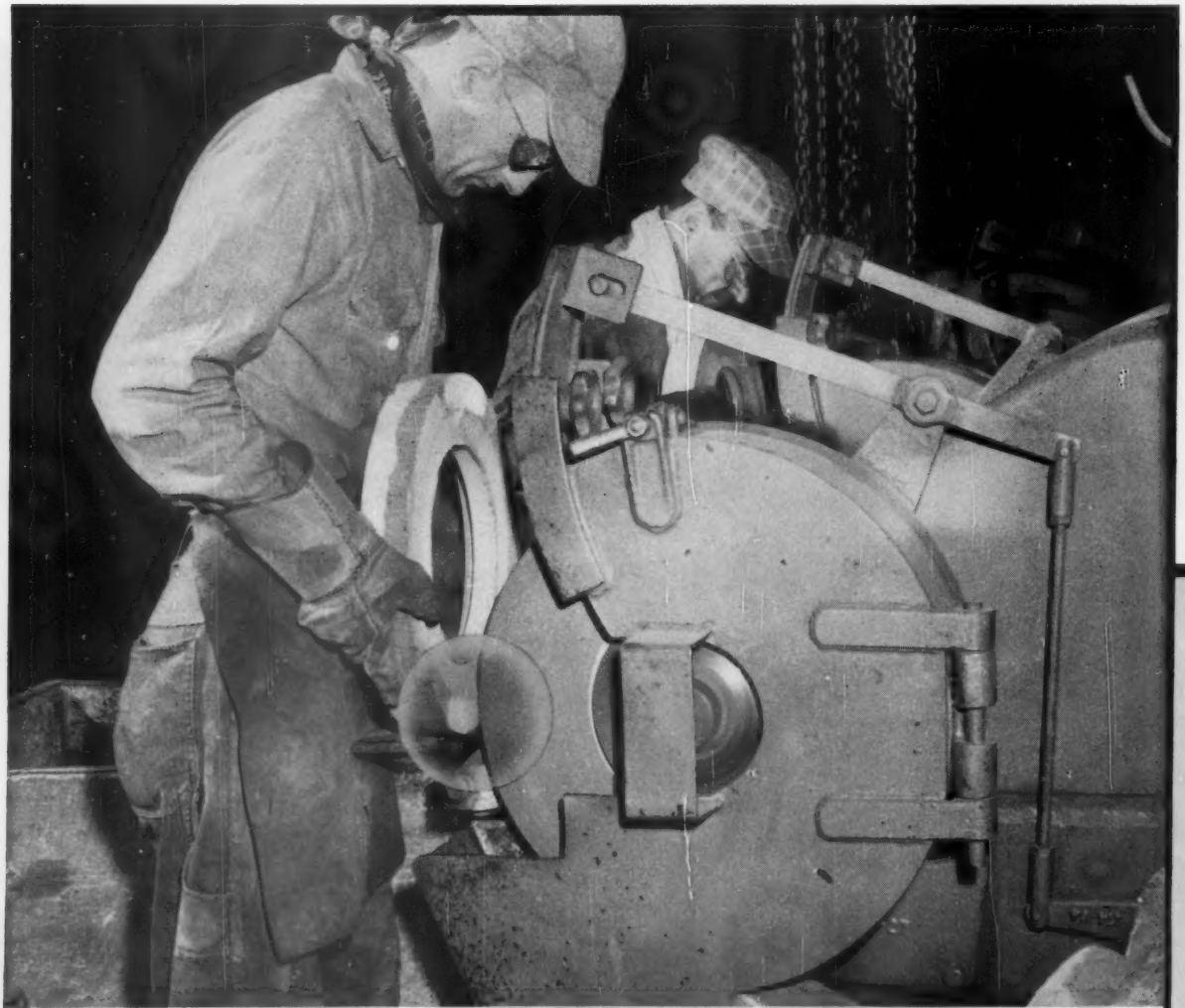
PHONE: TR 4-2000

3 hard-working wheels

CRYSTOLON K bond, ALUNDUM* B-11 bond and BN reinforced wheels bring the "TOUCH of GOLD" that adds product value and cuts grinding costs*

The most reliable way you can gauge any grinding wheel's value is by its *grinding quality* — the factor which takes into consideration *both* wheel cost and labor cost.

Continuous research and testing by Norton, together with many job-reports from non-ferrous foundries, prove that for three important types



A CRYSTOLON K BOND VITRIFIED WHEEL combines the abrasive and bond that make grinding this bronze casting easier, more economical. There's no better wheel for grinding brass and bronze on any type of machine.

for soft-metal grinding

of soft-metal grinding, these three types of Norton wheels with exactly the right grinding quality provide best performance at lowest cost.

FOR GRINDING BRONZE AND BRASS, Norton CRYSTOLON K bond vitrified wheels wear at just the right rate to assure the grinding quality that means more grinding for less money.

FOR GRINDING ALUMINUM, Norton ALUNDUM B-11 resinoid wheels offer the abrasive-and-bond combination that means fastest, coolest cutting action with longest wheel life.

FOR CUTTING-OFF AND NOTCHING gates and risers, Norton BN reinforced resinoid wheels combine unusually high resistance to breakage with fast cutting action and long wheel life.

Your Norton Distributor

will be glad to help you select wheels that will add the cost-cutting, product-improving "Touch of Gold" to every grinding job, on every material and every type of grinder in your cleaning room. Ask your Norton Distributor for the booklet *Rough Grinding*. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

W-1780

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

AN ALUNDUM B-11 RESINOID WHEEL, rough grinding aluminum castings, has the fast cutting action and long wheel life that add up to ideal grinding quality for applications on this metal.

A BN REINFORCED RESINOID WHEEL is not only useful for cutting-off and notching gates and risers but for light snagging and many other jobs. It's one of industry's safest, longest-lasting cut-off wheels.

NORTON
ABRASIVES
Making better products... to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

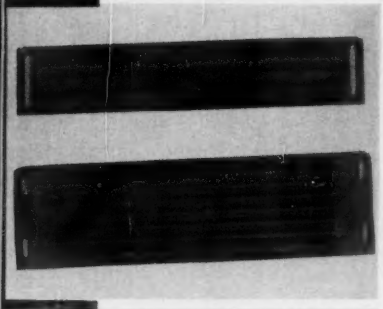
Circle 577 on Page 51

NO. 2F SIMPSON MIX-MULLER doubled sand output and eliminated 20 man hours of work per day when installed in 1950. Now handles week's *requirement* for dry shell sand on Saturday and all molding sand requirements in 12 hour daily work schedule.

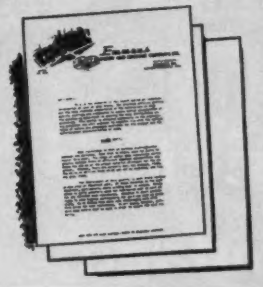
FOUNDRY COMPANY SELLS JOBBING CAPACITY ON AND SERVICE . . .

. . . "the dependability of operation and versatility of high grade sand turned out by these two mixers contribute greatly to our ability to fill our customers' casting requirements."

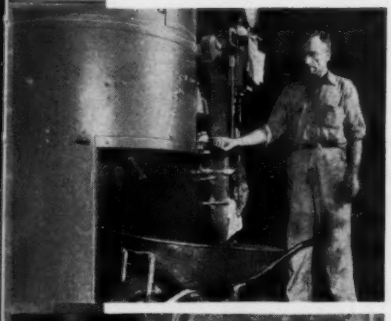
W. S. Thomas, Vice President Emmaus Foundry Company.



CLOSE SAND CONTROL required by Emmaus is typified by these Jacquard Knitting Machine grids cast in green sand.



TO MERCHANDISE Foundry capabilities and service Emmaus mails out 750 foundry "information" letters to local customers and prospects each month.



NO. 1H MIX-MULLER still works 8 hours a day . . . worked 12 to 18 without single break down for many years, according to operators. Was installed when foundry opened in 1947. Now handles shell core sand mixes.

FLUFFY SAND is delivered to molders through this compact National Aerator. Handles a full batch of highly flowable sand as fast as it is received from mixer discharge.

Progressive Pennsylvania Foundry relies on SIMPSON MIX-MULLERS

In 1947 William S. Thomas opened the doors of Emmaus Foundry Company in Emmaus, Pennsylvania with a firm conviction to produce and *sell* high quality castings in an area where competition is tough.

Nine years and 50 million pounds of castings later, in a prepared speech he said . . . "I have no sympathy whatever for the foundry that sells its products on price alone." A reviewal of Emmaus Foundry Company's major accounts after nine years of operating at 90% to 100% capacity adds weight to Mr. Thomas' comments.

Simpson Mix-Muller has pulled *its* weight with this quality-conscious foundry since the days the doors opened. Until 1950 a 1 Model H Simpson prepared *all* the sand used at Emmaus Foundry. It is still being used eight hours a day on shell and core sands. The Model 2F Simpson Mix-Muller shown at left now handles the payload at Emmaus on weekdays and prepares *a week's requirement* of shell sand on Saturdays. According to Mr. Thomas . . . "the dependability of operation and versatility of high grade sand turned out by these two mixers contribute greatly to our ability to fill our customers' castings requirements."

If *you* operate a Simpson Mix-Muller the Emmaus story may be typical of your own. If you don't—you may be interested in more proof of Simpson superiority. Your man from National *has* it. Ask him to arrange an inspection visit to a Simpson Mix-Muller equipped foundry *near you*. Write for details and remember . . .

Mixing and the integration of mixing facilities is our business.

NATIONAL Engineering Company

646 Machinery Hall Bldg.,

Chicago 6, Illinois

Circle 578 on Page 51

"... gets larger loads quicker ... faster delivery with less spillage"

HYDRAULIC LOAD SHOCK-ABSORBER

Exclusive standard "PAYLOADER" feature — cushions the loaded bucket during travel, reduces jounce and bounce, slashes spillage losses, permits faster, safe carrying speeds.

Earl S. Ensign of Ensign Foundry Company, Toledo, says "this torque-converter model HA 'PAYLOADER' has better traction therefore loads quicker plus faster delivery with less spillage. It is also much easier on the operator which insures a more efficient operation with less abuse to the machine."

This 55-year old cast iron job foundry uses the new-style model HA for many jobs but mainly for handling new and old sand between bins, mixers, shakeouts, perforators, slingers and molding stations. With a payload capacity of 18 cu. ft. this "PAYLOADER" has the largest capacity of any tractor-shovel in its size range.

If you have an older model HA or any other tractor-shovel anywhere near its size it will pay you to find out how much more the new style HA can produce. Your Hough Distributor would like to show you. Contact him today, and ask about Hough Purchase and Lease Plans too.

THE FRANK G. HOUGH CO.
703 Sunnyside Ave., Libertyville, Ill.

Send more "PAYLOADER" information on:

- ☐ Model HA (2,000 lb. carry capacity)
- ☐ Larger models (up to 9,000 lb. carry capacity)

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

1-A-2

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

Circle 579 on Page 51

Late News

OUTLOOK: Most business forecasts call for a relatively slow first half in 1958, followed by a turn for the better in the second half. Past trends of ferrous casting shipments support expectations of an upswing in foundry activity some time in 1958. Such cycles during the last ten years have lasted 1½ to 2 years, and from the chart on page 186 it will be noted that shipments have been moving irregularly downward since the spring of 1956.

Whether the expected recovery is sufficiently vigorous to bring the year's total ahead of that of 1957 remains to be seen. Sources close to the gray iron industry look for 1958 shipments of about 12½ million tons, against slightly below 13 million in 1957. Steel founders are forecasting a 10 per cent drop in the 1958 total to about 1.6 million tons. Malleable founders have hopes of exceeding slightly the 865,000 tons shipped in 1957.

HEADS COPPER DIVISION: William A. Meissner Jr., for the last five years deputy director of the Copper Division, BDSA, Department of Commerce, has been appointed director. Associated with the foundry and related industries for a number of years, Mr. Meissner organized and headed the Foundry Branch of the Copper Division, War Production Board, in 1942 and performed a similar task for the National Production Administration, predecessor of BDSA, in 1951.

FOUNDRY CLOSES: Somerville Iron Works, Chattanooga, Tenn., producer of soil-pipe and fittings, has been closed. A division of Tennessee Products & Chemical Corp., the company said the action was "due to economic conditions beyond its control."

WHITHER TITANIUM?: Titanium's bright future may have become temporarily tarnished in the last few months. Some new jet engine designs are calling for internal operating temperatures beyond the range at which titanium alloys function properly, and titanium ingot production has tapered off to an annual rate of about 10,000 tons.

K. W. Bartlett, president, Horizons Inc., Cleveland, a process and materials research organization, points out, however, that "it is more correct to state that the expected applications for the metal have since proven unfeasible, rather than the basic worth of the metal itself."

He states that commercial applications of titanium must solve these problems: 1. Cost reduction. 2. Development of a continuous refining process. 3. Development of a casting technique to defeat the metal's tendency to react quickly with refractories and atmospheres. 4. Development of a technique for rolling sheet to uniform thickness.

ASF PLANT ADDITIONS: Plant additions by American Steel Foundries next year are expected to be the largest in the company's history, and present indications are that 1958 will be a good year, President C. C. Jarchow has told stockholders. Additions in 1958 are expected to total a record $11 million. Largest capital expenditures will be for two new steel wheel plants, one by Griffin Wheel Co., at Muncie, Kans., and the other by Griffin Steel Foundries Ltd., in the Winnepeg area, at Transcona, Canada. The company's sales for the fiscal year ended Sept. 30, 1957, increased to $122,615,000 from $117,130,000 in the 1956 fiscal year.

PERSONALS: Edward P. Sandbach has been appointed chief metallurgist, Mackintosh-Hemphill Div., E. W. Bliss Co., Pittsburgh. He replaces Charles E. Peterson, recently named manager of manufacturing operations for the division's two plants . . . Harold Schulte and Herman Kretz have been made manager and assistant manager of production engineering, respectively, by Cooper Alloy Corp., Hillside, N. J. . . . Irvan S. Dow has become manager of Aluminum Co. of America's Cleveland operations. He succeeds Hugh J. Morrison, now assistant general manager of Alcoa's fabricat-

ing division, Pittsburgh . . . James L. Doyle has joined Detroit Gray Iron Foundry Co., Detroit, as a sales representative . . . Don DeMerce has been named plant manager, Mercast Mfg. Corp., LaVerne, Calif., a subsidiary of Mercast Corp. . . . Carl Winkler has been elected president, Cleveland Standard Pattern Works, Cleveland, succeeding the late Christian Birnbaum. John F. Roth takes over Mr. Winkler's former post as vice president . . . L. J. Venne has joined Electro Metallurgical Co., New York, as a metallurgical service representative and has been assigned to the Foundry Section, Metallurgical Service Division, Cleveland . . . Paul R. Gouwens has been appointed supervisor of the foundry and steelmaking section, Armour Research Foundation, Illinois Institute of Technology, Chicago.

HANDLERS ELECT: R. L. Fairbank, Towmotor Corp., Cleveland, was elected president, Material Handling Institute Inc., at its recent annual meeting. Eugene Caldwell, Baker-Raulang Co., Cleveland, was named first vice president and C. L. Fell, American MonoRail Co., Cleveland, second vice president.

DUCTILE IRON: Cooper - Bessemer Corp., Mount Vernon, Ohio, has adopted the sealed-ladle method of adding magnesium for the production of ductile iron. The method, developed in Europe, is known as the Schuchtermann & Kremer-Baum, or S-K-B, process. Addition of pure magnesium in a sealed ladle prevents the loss of alloying metal and eliminates the need for other metals to make up a master alloy.

MISCELLANY: Shipments of forgings have declined longer (for three years) and more sharply than those of castings . . . Oliver Corp. is expected to close its South Bend, Ind, foundry the end of this month and move part of its production to the Charles City, Iowa, foundry . . . Ford Motor Co. produced its 25 millionth V-8 engine on Dec. 19 . . . Oxygen supply will exceed immediate demand with the additional capacity provided by expanded producing plants of Linde Co., Div. of Union Carbide Corp., at Ashtabula, Ohio, and Fontana, Calif. . . . Howard M. Greenbaum, 51, secretary-treasurer, Acme Foundry Corp., Cleveland, died Dec. 16.

Prices of Foundry Metals and Coke

(As of Dec. 23, 1957)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$18.00-18.50
OVEN	
Birmingham	$28.85
Buffalo	30.50
Detroit	30.50
Erie, Pa.	30.50
Indianapolis	29.75
Kearny, N. J.	29.75
Milwaukee	30.50
Montreal, Que.	31.00
Neville Island (Pittsburgh)	29.25
New England, deld.	31.55
Painesville, O.	30.50
Philadelphia	29.50
St. Louis	31.50
St. Paul	29.75
Swedeland, Pa.	29.50
Terre Haute, Ind.	29.75

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	67.00	67.50
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 27.25; tin bronze, No. 225, 36.00; No. 245, 30.75; high-leaded tin bronze, No. 305, 31.25; No. 1 yellow, No. 405, 22.75; manganese bronze, No. 421, 24.50.

ALUMINUM: 99 per cent plus primary ingots 28.10. Secondary No. 12 alloy, 22.00-23.25. Deoxidizing grades: No. 1, 24.00, No. 4, 19.00.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 27.00, delivered Connecticut valley.

ZINC: High grade 11.35 delivered. Die casting alloy No. 3, 14.25; No. 2, 15.25, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$29.00–30.00	$48.00–49.00	.....	.....	.....	.....	$48.00–49.00
Boston*	**23.00–24.00	**33.00–34.00	.....	.....	**35.00–36.00	.....	.....
Buffalo	31.00–32.00	**36.00–37.00	.....	.....	**41.00–42.00	.....	50.00–51.00
Chicago	32.00–33.00	37.00–38.00	.....	41.00–42.00	41.00–42.00	45.00–46.00	49.00–51.00
Cincinnati*	**29.00–30.00	**35.00–36.00	**32.00–33.00	.....	**47.00–48.00	.....	**52.00–53.00
Cleveland	26.00–27.00	38.00–39.00	29.00–30.00	42.00–43.00	40.00–41.00	49.00–50.00	55.00–57.00
Detroit*	**21.00–22.00	**31.00	**24.00	**33.00	.....	34.00	.....
Los Angeles	39.00	**52.00	.....	.....	.....	.....	.....
New York*	33.50	34.00–35.00	33.00–34.00	.....	.....	.....	.....
Philadelphia	37.00	38.00	37.00	.....	49.00–50.00	56.00	62.00–64.00
Pittsburgh	31.00–32.00	39.00–40.00	.....	42.00–43.00	51.00–52.00	.....	55.00–57.00
St. Louis*	35.00	43.00	32.00	43.00	.....	.....	47.00
San Francisco	36.00	45.00	34.00	45.00	45.00	.....	.....
Seattle	34.00	35.00	32.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

WHITEHEAD'S
MOISTURE CONTROLLED
NATURAL BONDED
DORCHESTER MOLDING SANDS AND GRAVELS

Guaranteed Moisture Content Not More Than 6%

LEADER IN FOUNDRY SANDS SINCE 1841

These natural bonded sands and gravels are widely used for Molds and Cores in Iron, Steel, Alloy, and Non-Ferrous Castings. They are noted for colloidal clay giving high green and dry strength. Because of low fines in the grain distribution, these sands have high permeability. Here are advantages you may expect from Whitehead's Naturally Bonded Moisture Controlled Dorchester Sands and Gravels.

1 ***Moisture Controlled Sands Do Not Freeze—***

a. Easier to unload . . . means lower unloading costs.
b. Reduces handling costs to and from storage bins.

2 ***Moisture Controlled Sands Are Economical—***

a. Sands with 15% moisture have 1700 lbs. sand and 300 lbs. water in each ton.
b. Moisture Controlled Sands with 6% moisture have 1880 lbs. sand and 120 lbs. water in each ton.
c. On each ton of Moisture Controlled Sands you *SAVE price of sand and freight on 180 lbs. of water.* Sand has just proper amount of moisture to eliminate dust hazard.

3 ***Ready for Use on Arrival at Foundry—***

a. Dorchester Moisture Controlled Sands and Gravels arrive with proper working moisture content so that they can be used at once.
b. Aids you in control of sands in foundry.

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
17 Exchange Place, Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

DOB-IT
Ready-to-use core mudding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 580 on Page 51

NO CURL...

The Biggest News in

Safety Leggings and Spats

...thanks to American Optical Engineering!

ADVANTAGES

1. **Positive Protection against Molten Metal Splash**
2. **Snug Conformity of the Flare with the Shoe**
3. **Longer Life — Up to 400% Approximately**

You're looking at a revolutionary development in Protective Leggings and Spats — American Optical's new "no-curl" flare. It's made of a specially developed compound which always "behaves" — *lies flat on the shoe.* We've tested it against all molten metals from lead to steel. One steel mill, for example, reported no curling — *no sign of curling* in eight to ten weeks of constant use!

Yes, and this flare lasts as long as the basic legging or spat — will give you and your men up to 400% more active use than leggings and spats made with conventional flares.

So, once again American Optical comes up with a quality "first" that gives you more for your money — proving it *pays* to insist on Ⓐ trademarked safety products. Your nearest American Optical Safety Products Representative can supply you.

S-1512CL SPRING TYPE LEGGING

Flare is 5½" down crown. Chrome tanned cowhide uppers riveted to spring steel frame. No adjustment necessary. Easily put on and removed. Fits securely at ankle and below knee. Protects lower leg, ankle, instep.

S-1481A Same as S-1512 but with uppers of asbestos. Both S-1512CL and S-1481A have spring clip on instep which holds flare in position.

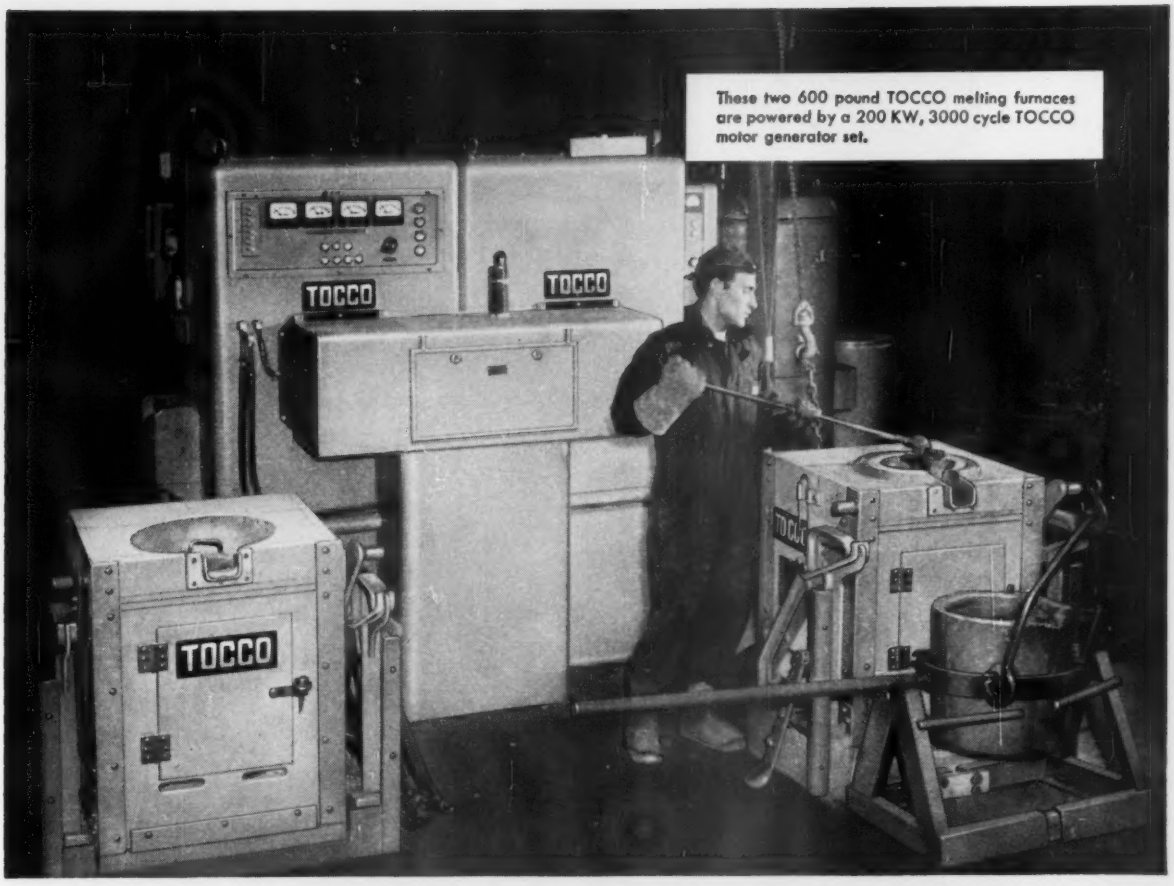
S-7X 211 SPAT

Flare is 7½" long down the crown — long enough to be trimmed to the smaller foot. 2 leather bag straps on leg have slide fasteners for quick adjustment. Snap fasteners for quick release. Chrome tanned cowhide uppers with wide elastic webbing also equipped with 2 snap fasteners for speedy release. Understrap is same type of material as flare and is replaceable.

Always insist on the Ⓐ Trademark on Lenses and Frames

American Ⓐ Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



These two 600 pound TOCCO melting furnaces are powered by a 200 KW, 3000 cycle TOCCO motor generator set.

TOCCO* Induction Melting "Delivers"— In Two Days Instead of Two Months!

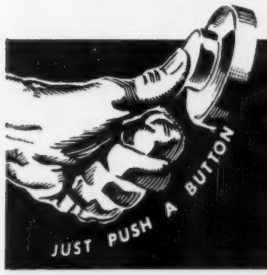
Casting backlogs at Commercial Shearing and Stamping Co. in Youngstown, Ohio used to lag from 8 to 10 weeks behind production schedules. By installing four 300 pound TOCCO melting furnaces this firm upped daily melting capacity to 16,000 pounds. Now orders can be shipped in 48 to 72 hours.

In a foundry occupying less than 5000 square feet of space, production of castings jumped between 40% and 50%; tensile strength of alloy castings was boosted from 35,000 to 50,000 p.s.i. Substantial savings in the cost of castings have resulted. Moreover, with precision casting and molding on a push button basis, many former drilling and roughing operations were completely eliminated.

Many firms have discovered that TOCCO Induction Melting insures maximum quality control, increased volume and lower operating costs.

Look to TOCCO also for *vacuum* melting furnaces of up to *5,000 pounds* capacity.

THE OHIO CRANKSHAFT COMPANY



TOCCO

Trade Mark Reg. U.S. Pat. Off.

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. F-1, Cleveland 5, Ohio

Please send copy of "The Case for TOCCO Induction Melting."

Name_____

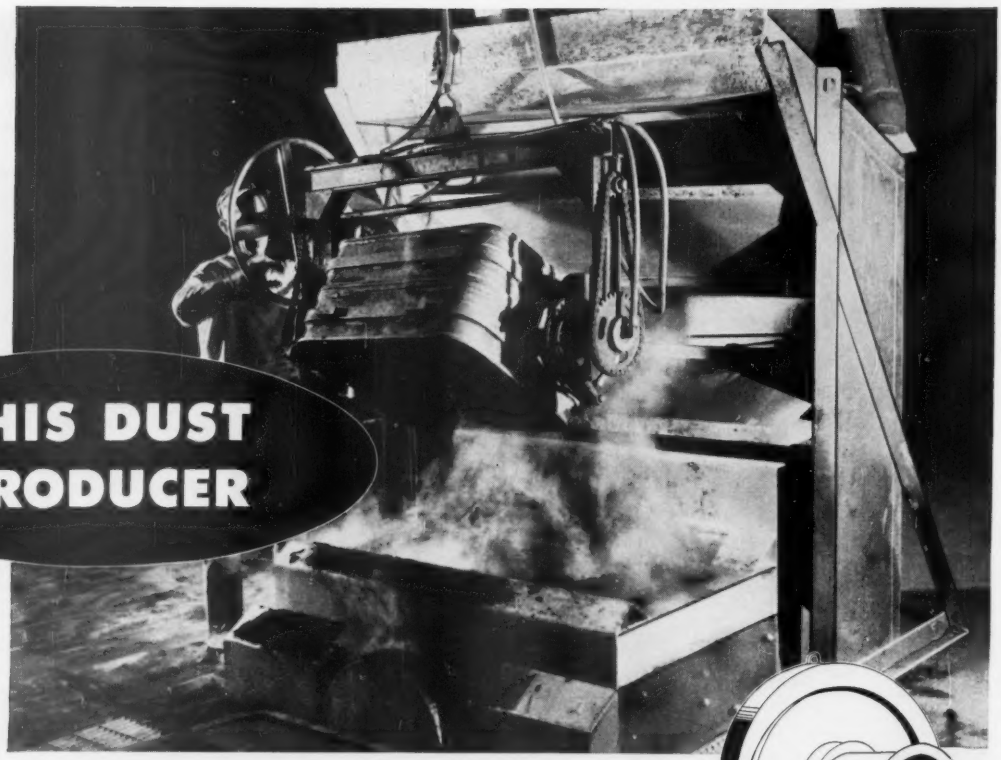
Position_____

Company_____

Address_____

City_____ Zone____ State____

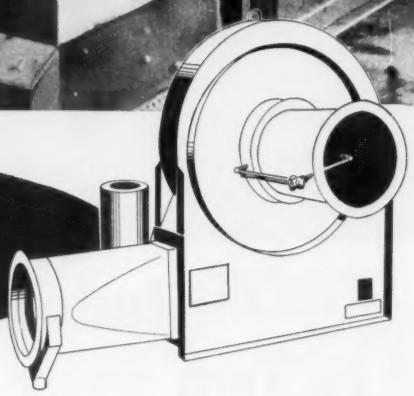
Circle 582 on Page 51



THIS DUST PRODUCER

meets its master in

THIS DUST COLLECTOR



AAF Type W ROTO-CLONE takes shakeout dust in tow!

AAF's wet-collecting Type W ROTO-CLONE is the No. 1 enemy of foundry shakeout dust. They've been "meeting" for many years, always with the same result: *the dust is immediately routed and reduced to a harmless sludge.*

High efficiency, low cost and small space requirements make the Type W a "natural" for shakeout operations. Water sprays extend the effectiveness of its dynamic forces to the collection of the very lightest and finest dust particles. The Type W requires little maintenance, uses a minimum of water and maintains its efficiency regardless of air volume.

For complete product information on the Type W ROTO-CLONE, call your local AAF representative or write direct for Bulletin 277.

AAF herman nelson

American Air Filter
COMPANY, INC.

266 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Herman Nelson Portable Heaters

Illinois Heating Specialties

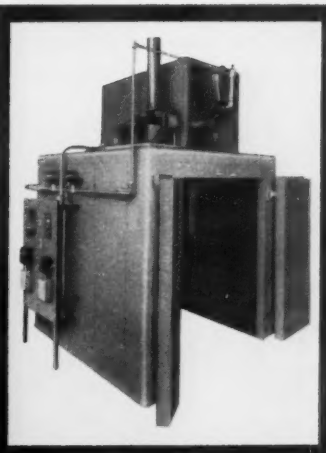
BETTER AIR IS OUR BUSINESS

AAF Electric Furnace Hoods

AAF Type K Exhauster

Foundry Products and Production Rates Dictate Oven Requirements

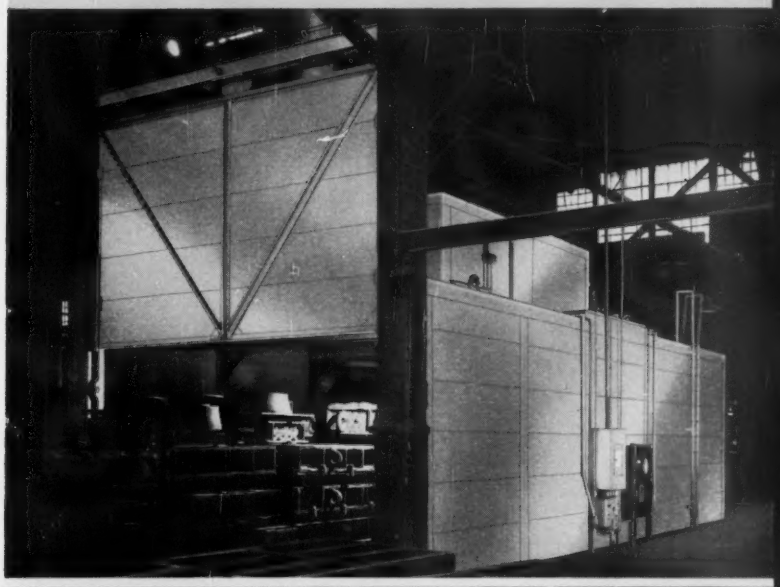
LANLY can meet any and all of yours

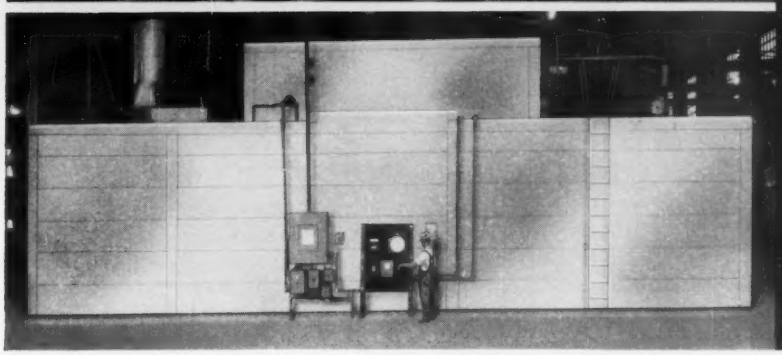


- from Small RACK TYPE OVENS

generally used when the baking of smaller cores is required in the production operation of your foundry.

-to Gigantic CAR TYPE OVENS





when the drying of large molds and cores for bigger castings is required.

This huge installation in the foundry of a large supplier of railroad products efficiently and economically carries its share of the load in the production of better castings.

Consult LANLY for a proposal on foundry ovens before you buy. A check of your present equipment may disclose a fuel eater, a core spoiler or a heat loser amongst them.

WRITE FOR THE LATEST CATALOG AND FACTS ON ANY INSTALLATION

THE lanly CO.

FOUNDRY OVENS

780 Prospect Ave. • Cleveland, Ohio

Circle 584 on Page 51

HINES *round and hex* FLASKS...

HINES 3-PART ROUND SLIP FLASK

HINES round slip flasks are made to your specifications — two or more parts, with handles, trunnions or pads, steel wearing strips. Upset frames available for cope or drag. Diameters 12" to 36".

. . . CUT COSTS ON JOBBING WORK

- Faster, more uniform ramming!
- No shakeout!
- Small investment — just one flask and a few jackets!
- Extremely flexible — can be used for a wide variety of jobs!
- Use much less sand!
- Less storage and handling!
- Ideal for brake drums, gears, pulleys, sprocket wheels, sheaves, fire pots, brooder stoves, cultipacker wheels, etc.
- We're ready to help you with such molding problems!

HINES 4-PART, HEX, "POP-OFF" FLASK

HINES hex, "POP-OFF" flasks are available in two or more parts as required — with handles or trunnions. Upset frames available. Sizes 12" to 36".

The

HINES FLASK CO.

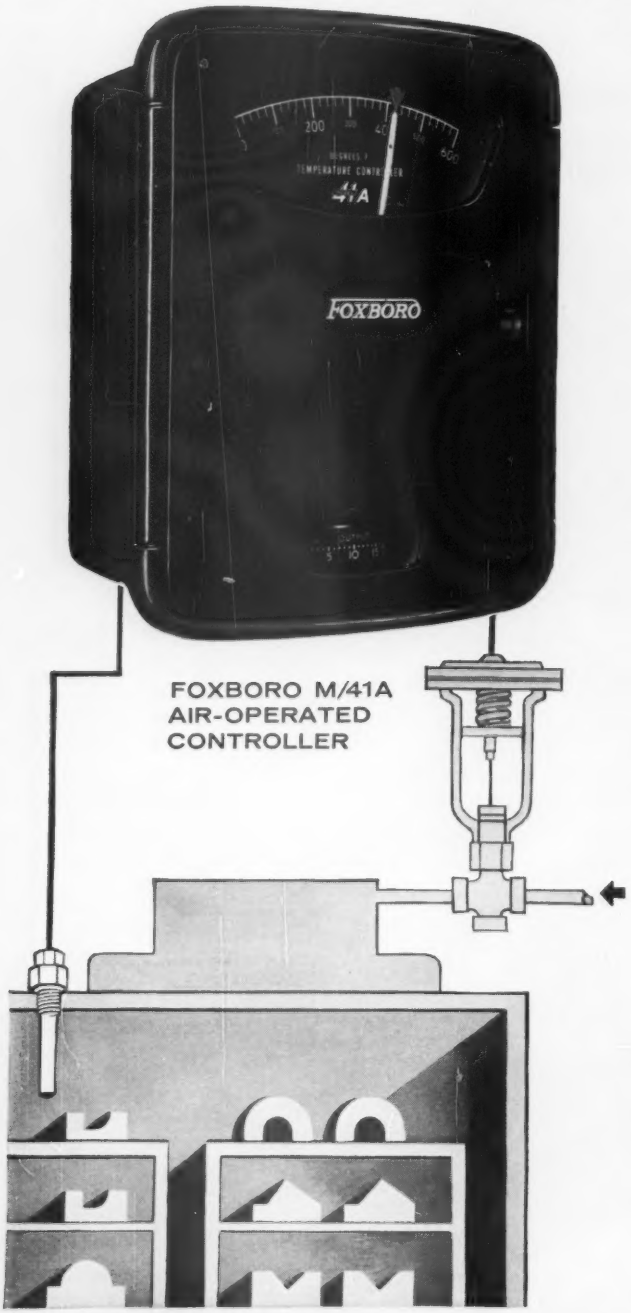
3431 WEST 140th ST. CLEVELAND 11, OHIO

But one HINES flask and a small number of HINES jackets were used to produce this floor of brake drum molds, shown here ready for pouring.

Circle 585 on Page 51

WHY RISK CORE FAILURES?

... meet critical baking requirements precisely



WITH FOXBORO M/41 CORE OVEN TEMPERATURE CONTROL

You can be *sure* that you are maintaining the critical baking temperatures which today's complex sand mixes require . . . when your core oven is equipped with the Foxboro M/41. There's no guesswork: This Controller's large indicating scale continuously shows "set" temperature and actual oven temperature . . . proves to the operator that cores are getting the specified bake *precisely*. And models are available for every type of heating system.

Both the M/41A (air-operated) and the M/41E (electric) sense the smallest changes in temperature . . . both respond with positive-power control action. Both are high-accuracy devices, built for years of dependable, trouble-free service.

Protect the quality of your core production with quality core oven control. Specify Foxboro M/41 Temperature Control (air-operated or electric-operated) on new equipment, or install easily and quickly on your present ovens. For detailed information, write for Bulletin 5A-13A. **The Foxboro Company, 321 Neponset Avenue, Foxboro, Massachusetts.**

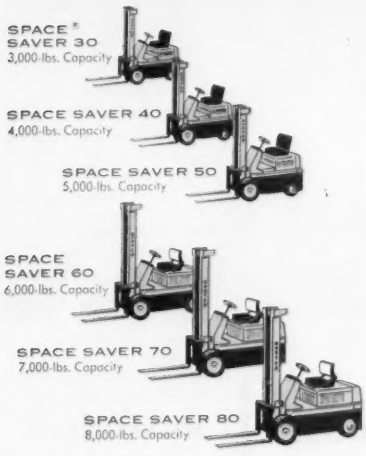
FOXBORO

REG. U.S. PAT OFF.

COMPLETE FOUNDRY INSTRUMENTATION

Circle 586 on Page 51

ERNEST G. SWIGERT, President, Hyster Company



Functionally styled by Henry Dreyfuss.

THE FINEST CUSHION TIRE LIFT TRUCKS EVER BUILT

SPACE SAVER 60 SPACE SAVER 70 SPACE SAVER 80

This new series of cushion tire lift trucks is the crowning achievement of the finest engineering, industrial design and testing available today. The joint planning of Hyster engineers and Henry Dreyfuss, industrial designer, results in a series of 6,000, 7,000 and 8,000 lb. capacity trucks unequalled for productive maneuverability, operating economy and handling efficiency.

Prove to yourself why we say these trucks are, without question, the finest cushion-tire lift trucks ever built. Schedule a demonstration at your own plant, or see them today at any Hyster dealer store.

HYSTER®

World's foremost manufacturer of Industrial Trucks

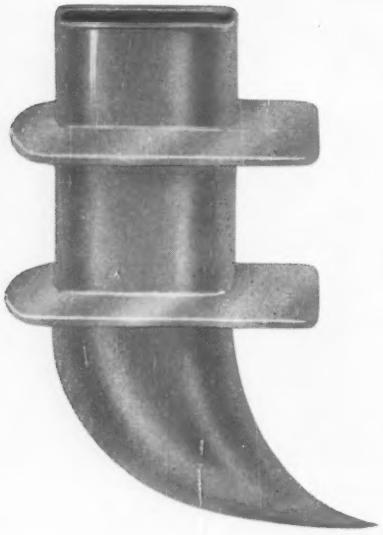
Factories: Portland, Oregon • Danville, Illinois
Peoria, Illinois • Nijmegen, The Netherlands
Sao Paulo, Brazil • Glasgow, Scotland
Sydney, Australia (licensee)

Circle 587 on Page 51

BETTER, HARDER CORES...
BETTER, STRONGER MOLDS...

for close-tolerance castings

DELTA SILICATE BINDERS



Delta Silicate Core and Mold Binders can be hardened by gassing with CO_2, warm air, nitrogen and other gaseous vapors and also by oven drying.

FOR CORES—

285XX Good shake out with low retained hot strength

299XX Excellent shake out with very low retained hot strength

FOR MOLDS—

270XX Fair shake out with high retained hot strength

292XX Poor shake out with maximum retained hot strength

When used as recommended, sands prepared with Delta Silicate Binders have excellent bench life and other unusual properties which are "exclusively Delta". When "set", molds and cores have the necessary strength to insure a high production rate.

If improved flowability and release properties are necessary with the use of any type of silicate binder, Delta Sand Conditioning Oil or Delta No. 298 Release Agent is recommended.

DELTA

Get the facts... Working samples and complete literature on Delta Silicate Binders will be sent to you on request for test purposes in your own foundry.

DELTA OIL PRODUCTS CO.
MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

Why LINK-BELT-mechanized sand handling consistently

increases production, improves working conditions

MOLDING STATION LINE is designed for high production. Individual overhead molders' hoppers eliminate floor storage of sand—promote a cleaner foundry.

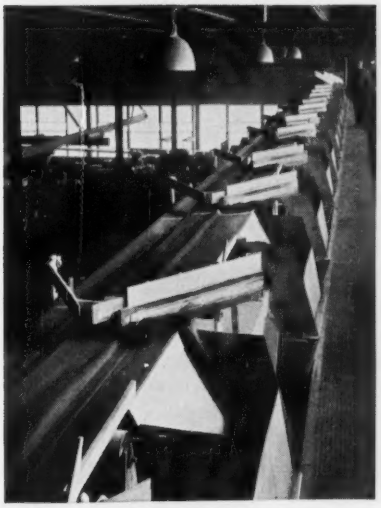
System at A. B. Chance non-ferrous foundry holds down unit costs, utilizes maximum use of manpower

LIKE other progressive foundries all over the country, A. B. Chance Co. of Centralia, Mo., has found Link-Belt sand handling mechanization the key to more profitable operations. By improving the quality of their prepared sand, this foundry reduced scrap and increased production. Also, working conditions were improved because the foundry was made cleaner and more orderly.

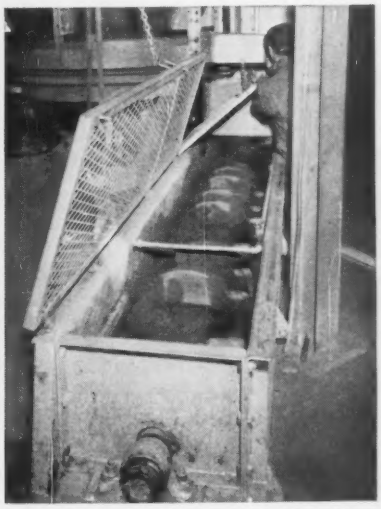
No two foundry mechanization problems are alike. That's why it will pay you to take advantage of Link-Belt's broad experience and equipment in laying out a system for handling sand and castings best suited to your requirements. Call your Link-Belt office today or write for Book 2423.

LINK-BELT

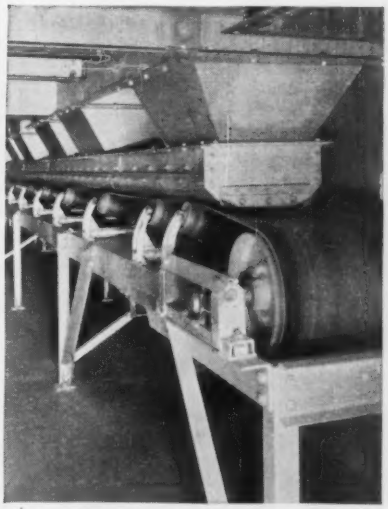
CONVEYORS AND PREPARATION EQUIPMENT



DISTRIBUTING BELT CONVEYOR delivers prepared sand to molding stations directly below. System is designed to handle approximately 40 tons per hour of prepared sand for production of brass and aluminum castings.



PADDLE MIXER combines water with shakeout sand from storage bin producing a uniform molding sand. Link-Belt makes single- and double-shaft mixers in a range of capacities.



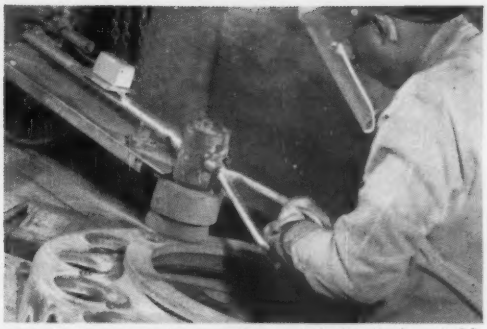
TRANSFER BELT CONVEYOR under floor receives shakeout sand through grates and transfers it to bucket elevator. Conveyors can be equipped with magnetic devices to remove ferrous metal particles.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

14.622

His new grinding technique

Twenty-eight years ago Jack O'Sullivan was running a swing-frame grinder for Crucible Steel... now he's President of Engineered Sales Co., one of New Jersey's largest abrasive distributors. He knows grinding from the operator's point of view and from the cost accountant's.

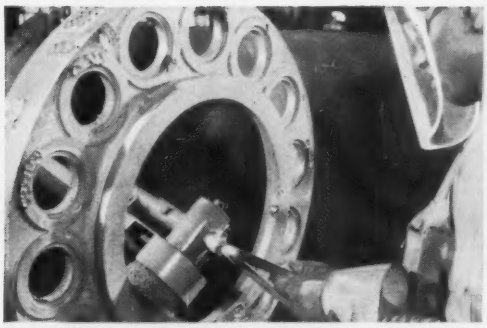


New baby swing-frame takes weight load of portable grinder off operator . . . enables him to grind smooth, flat surface without accidental scars and nicks due to fatigue.

Big foundries have big grinding problems. For example, Cooper Alloy Corporation, pioneer in the production casting of stainless steel valves and fittings, had this one: they found that some grinding jobs just couldn't be done with big swing-frame grinders. Yet they were backbreakers when done with portables . . . expensive, too.

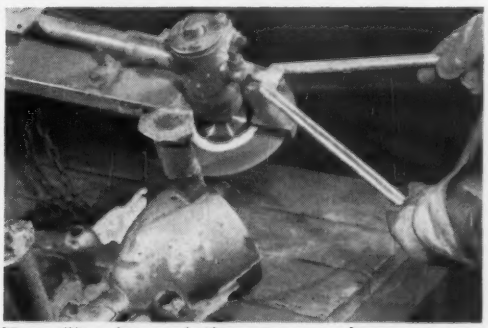
cuts costs and back-aches

They *were*, that is, until Bay State distributor Jack O'Sullivan came up with an idea. Working with Bay State and Fox Grinders, Inc., he devised a baby swing-frame that used the conventional cup and raised hub disc wheels normally used only on portables. This enabled Cooper's operators to grind hard-to-reach surfaces and notch or cut off sprues, gates and risers . . . without fatigue . . . and with a great deal more speed and accuracy.



Tricky I. D. grind demands a light, precise touch with a coarse-grained cup wheel (tapered or straight). Operator is free to concentrate on accuracy.

Like Jack O'Sullivan, *all* Bay State representatives are more than just grinding wheel salesmen. That's why they often come up with ideas that result in basic operating improvements. Why not call in *your* Bay State man? **Better grinding at lower cost – that is his business.**



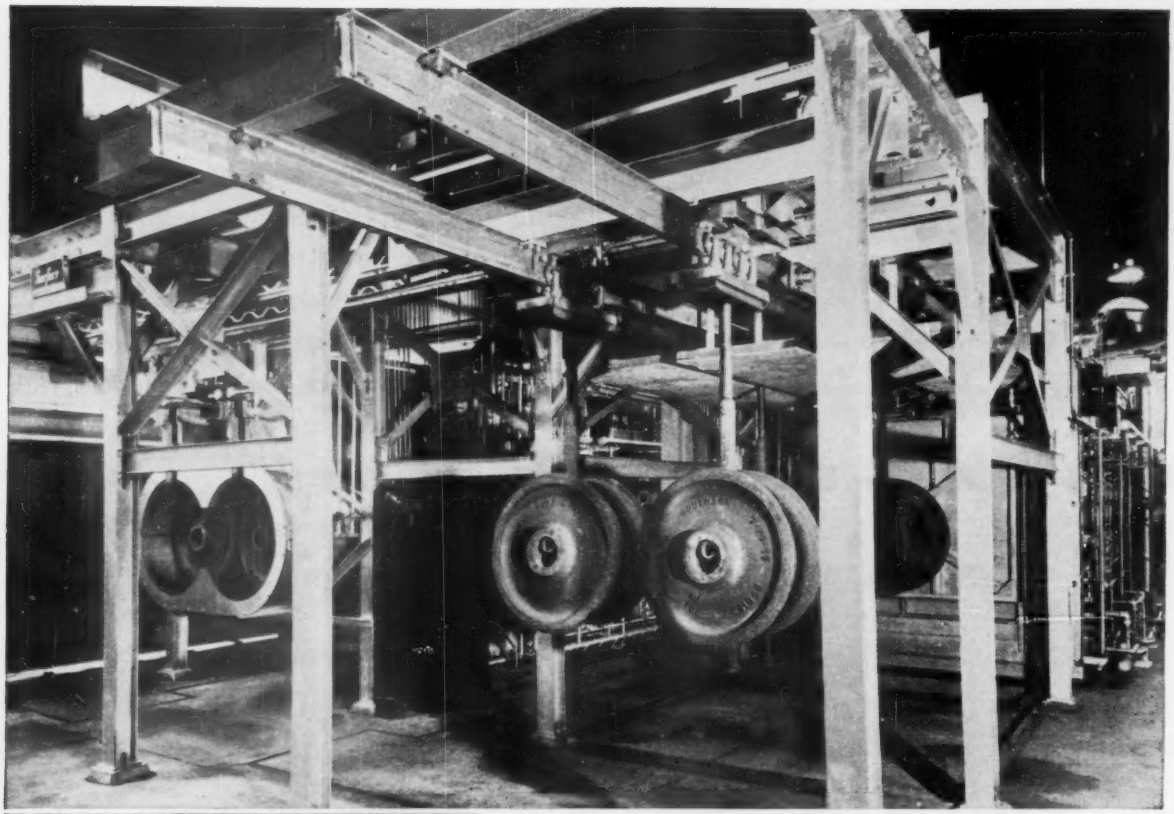
Versatility of new grinding set-up permits operators to use Bay State raised hub disc wheels ("hat" wheels) for notching and cutting off sprues, gates, risers.

BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts. *Distributors:* All principal cities.
In Canada: Bay State Abrasive Products Co., Ltd., Brantford, Ontario.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.

Circle 590 on Page 51



Wheels are transported in sets of 4 by overhead American MonoRail thru heat treating operation.

American MonoRail deposits red-hot wheels in insulated pits.

Railroad car wheels travel by

AMERICAN MONORAIL

- get heat treated while aboard

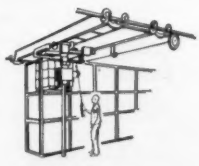
The first ride these wheels ever take is aboard an American MonoRail which expresses them red-hot to insulated pits where they cool slowly for 5½ hours.

After removal from the pits by MonoRail crane, the wheels are loaded in sets of 4 on MonoRail hangers which transport them thru two furnaces for double heat treating.

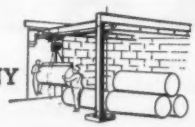
Experienced MonoRail engineers will tailor-make a cost-saving handling system from standard parts to fit your specific needs.

Write today for Bulletin C-1.

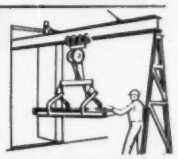
AUTOMATIC DISPATCH



STACKER CRANE



MANUAL MONORAIL



RETRACTABLE CRANE

Member of Materials Handling Institute and MonoRail Manufacturers' Association.

For Power Driven Conveyors, Use Landahl Chainless Conveyors

AMERICAN MONORAIL COMPANY

OVERHEAD HANDLING EQUIPMENT

13104 ATHENS AVENUE • CLEVELAND 7, OHIO

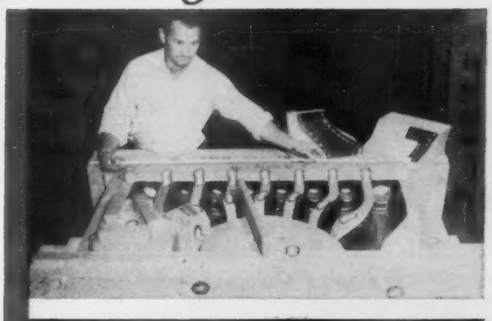
(IN CANADA—CANADIAN MONORAIL CO., LTD., GALT, ONT.)

KOLD-SET®

The Original Kold Setting Binder

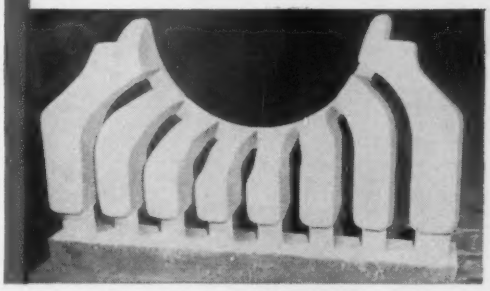
1.

Core box for making 500 lb. Zircon steam chamber core prior to pouring with Kold-Set sand.



2.

500 lb. Zircon steam chamber core must clean through 4" dia. ports. Double coat Kold-Set Zircon Wash applied green. Oven dried 8 hours at 425°F., rewashed, dried 4 hours.



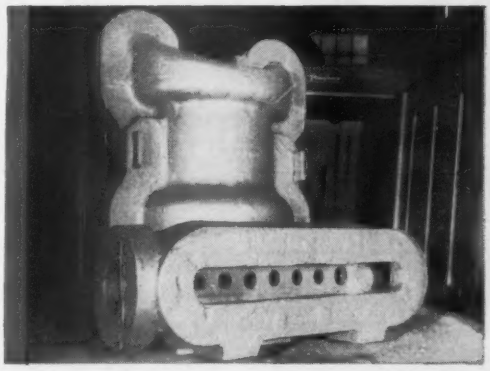
FORMULA FOR QUALITY
at ATLANTIC STEEL CASTINGS COMPANY
Chester, Pennsylvania

Atlantic is producing high-pressure steel castings of highest quality at substantially lower cost with Kold-Set cores.

3.

Turbine Base Casting (finished weight, 6500 lbs.) Direct cleaning time for steam chamber reduced from 5 days to less than 8 hours with Kold-Set core.

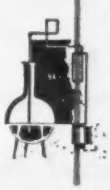
CLEANING TIME REDUCED 4 FULL DAYS



FIRST in Quality
—High grade raw materials and quality control during manufacture make KOLD-SET stand out first in performance—always uniform and made to the original formulation.

FIRST in Service
—A new method, such as the KOLD-SET process, must be introduced with service. Our engineers are experienced and can instruct in the proper method of application so you will derive the best performance at the greatest savings.

FIRST in Performance
—A quality product plus dependable engineering service have proven most important to consistent results. You can depend on controlled core production and excellent cast finish when KOLD-SET is used.



KOLD-SET®

G. E. SMITH, INC.

246 Washington Road Pittsburgh 16, Pa.

ORIGINAL AND EXCLUSIVE MANUFACTURERS OF THE KOLD-SET PROCESS IN THE UNITED STATES

Circle 592 on Page 51

BLAST!

the Hard-to-get-at spots.....

Quickly and Economically

with

Norbide® Pressure Blast Nozzles

You'll find there's a NORBIDE Nozzle available to give you exactly the type of cleaning stream you need — from a pencil-thin stream for cleaning hard-to-get-at spots to a broad stream for large areas. And NORBIDE Nozzles - lined with the hardest manufactured material commercially available — maintain stream contour, last longer than any other nozzle made and deliver maximum blasting efficiency at minimum cost per hour.

NORTON COMPANY
43 New Bond St., Worcester 6, Mass.

NORTON®
BORON CARBIDE
Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Behr-cat Tapes

NORBIDE®... The Longest Nozzle Life You Can Buy

Reader Information Service

FOUNDRY

Use these cards for more information on anything advertised in this issue, or for extra copies of editorial articles. Don't overlook additional cards on page 192 for more information on items described in the Foundry Equipment and Supplies Digest section in this issue.

FURTHER INFORMATION on Advertised Products ?

January 1958

SIMPLY CIRCLE AD ITEM NUMBER BELOW

521	536	551	566	581	596	611	626
522	537	552	567	582	597	612	627
523	538	553	568	583	598	613	628
524	539	554	569	584	599	614	629
525	540	555	570	585	600	615	630
526	541	556	571	586	601	616	631
527	542	557	572	587	602	617	632
528	543	558	573	588	603	618	633
529	544	559	574	589	604	619	634
530	545	560	575	590	605	620	635
531	546	561	576	591	606	621	636
532	547	562	577	592	607	622	637
533	548	563	578	593	608	623	638
534	549	564	579	594	609	624	639
535	550	565	580	595	610	625	640
641	656	671	686	701	716	731	746
642	657	672	687	702	717	732	747
643	658	673	688	703	718	733	748
644	659	674	689	704	719	734	749
645	660	675	690	705	720	735	750
646	661	676	691	706	721	736	751
647	662	677	692	707	722	737	752
648	663	678	693	708	723	738	753
649	664	679	694	709	724	739	754
650	665	680	695	710	725	740	755
651	666	681	696	711	726	741	756
652	667	682	697	712	727	742	757
653	668	683	698	713	728	743	758
654	669	684	699	714	729	744	759
655	670	685	700	715	730	745	760
761	776	791	806	821	836	851	866
762	777	792	807	822	837	852	867
763	778	793	808	823	838	853	868
764	779	794	809	824	839	854	869
765	780	795	810	825	840	855	870
766	781	796	811	826	841	856	871
767	782	797	812	827	842	857	872
768	783	798	813	828	843	858	873
769	784	799	814	829	844	859	874
770	785	800	815	830	845	860	875
771	786	801	816	831	846	861	876
772	787	802	817	832	847	862	877
773	788	803	818	833	848	863	878
774	789	804	819	834	849	864	879
775	790	805	820	835	850	865	880

EXTRA COPIES OF ARTICLES ?

FILL IN PAGE NUMBER AND TITLE OF ARTICLES DESIRED

Page No. Title of Article

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NAME .....

POSITION .....

FIRM .....

STREET .....

CITY ..... ZONE.....

STATE .....

PRODUCT MANUFACTURED .....

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525	540	555	570	585	600	615	630
526	541	556	571	586	601	616	631
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645	660	675	690	705	720	735	750
646	661	676	691	706	721	736	751
647	662	677	692	707	722	737	752
648	663	678	693	708	723	738	753
649	664	679	694	709	724	739	754
650	665	680	695	710	725	740	755
651	666	681	696	711	726	741	756
652	667	682	697	712	727	742	757
653	668	683	698	713	728	743	758
654	669	684	699	714	729	744	759
655	670	685	700	715	730	745	760
761	776	791	806	821	836	851	866
762	777	792	807	822	837	852	867
763	778	793	808	823	838	853	868
764	779	794	809	824	839	854	869
765	780	795	810	825	840	855	870
766	781	796	811	826	841	856	871
767	782	797	812	827	842	857	872
768	783	798	813	828	843	858	873
769	784	799	814	829	844	859	874
770	785	800	815	830	845	860	875
771	786	801	816	831	846	861	876
772	787	802	817	832	847	862	877
773	788	803	818	833	848	863	878
774	789	804	819	834	849	864	879
775	790	805	820	835	850	865	880

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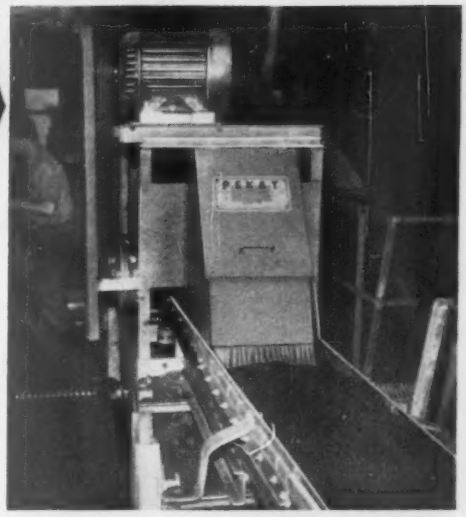
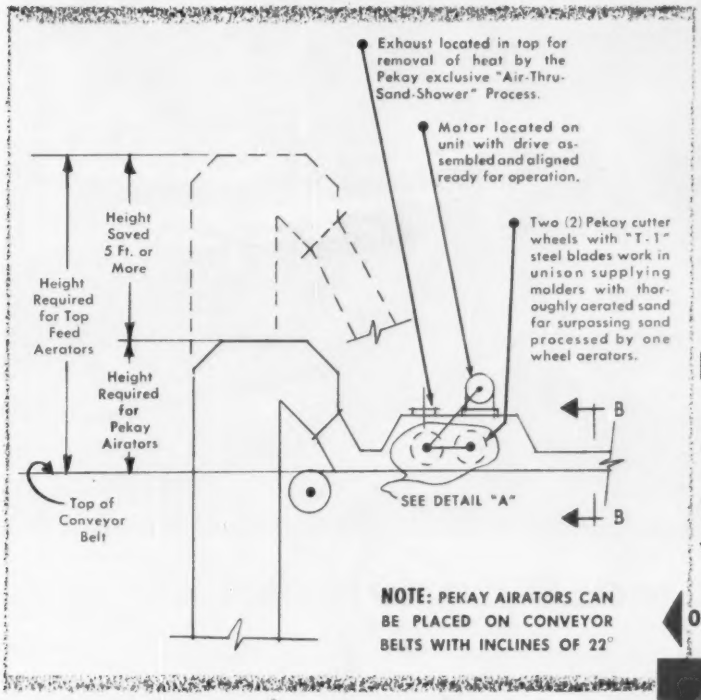
FOR THE BEST BLENDING and AERATING AT THE LOWEST COST, INVESTIGATE PEKAY BEFORE YOU BUY

The Pekay Airator requires no special supports. Unit fits right on your present conveyor channels requiring little space and can be placed anywhere in your sand system in less than 25 man hours.




Exhaust located in top for removal of heat by the Pekay exclusive "Air-Thru-Sand-Shower" Process.
Motor located on unit with drive assembled and aligned ready for operation.
Two (2) Pekay cutter wheels with "T-1" steel blades work in unison supplying molders with thoroughly aerated sand far surpassing sand processed by one wheel aerators.
Height Saved 5 Ft. or More
Height Required for Top Feed Aerators
Height Required for Pekay Airators
Top of Conveyor Belt
SEE DETAIL "A"
B
B
NOTE: PEKAY AIRATORS CAN BE PLACED ON CONVEYOR BELTS WITH INCLINES OF 22°

ECONOMIZE TODAY WITH PEKAY

SAVE

- On reduced machining and scrap losses
- On lower operating and maintenance
- On easier and faster installation

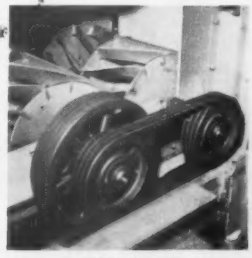
ON LOWER ELEVATOR AND BUILDING REQUIREMENTS

Specifications:

Belt Width	Cutter Wheel Diameter	Maximum Sand Head	Capacity for belt Traveling 100 FPM
18	12	3½	40 T. P. H.
24	16	5½	125 T. P. H.
42	20	8½	410 T. P. H.

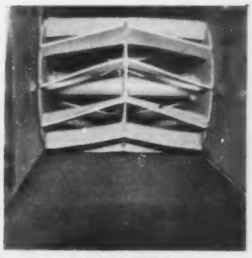
Pekay Airators can be made for any belt width and capacity

Every unit guaranteed to meet customer requirements



DETAIL "A"

Easy access to parts. Complete wheel replacement takes less than 2 hours. Wheel life averages two years on 40 hour week operation.



SECTION "B-B"

Cutter wheels traveling at 500 to 600 RPM thoroughly fluff, aerate, cool and break all lumps except core butts the size of pencil erasers.

PEKAY MACHINE & ENGINEERING CO. INC.

866 N. SANGAMON STREET CHICAGO 22, ILLINOIS

Specialists in foundry sand conditioning and handling, slurry systems, engineering and equipment

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____ CITY AND STATE_____

I would like information on:

☐ Pekay Mixer Mullers ☐ Pekay Coolerators

☐ Pekay Sand Systems ☐ Pekay Airators

☐ Pekay M-T-Matic Buckets

For the finest in Mechanization

Jeffrey's **UNIVERSAL MOLD CONVEYOR** is Flexible

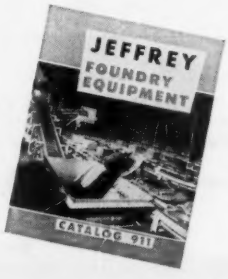
Molds move on the level, up, down and around on the Jeffrey Universal Mold Conveyor . . . full operations at elevations to best suit each job. It's working in many foundries around the country, helping to boost their earnings.

Operation is smooth; power consumption is low; equipped with sealed-for-life ball bearings and oil-impregnated bushings; internal takeup on each car.

All moving parts are shielded, giving full protection against sand, shot and runout. Rugged construction gives strength to spare for the toughest jobs.

MORE FACTS:

New Catalog 911 tells about this and other Jeffrey foundry equipment. For a copy, write The Jeffrey Manufacturing Company, 907 N. Fourth Street, Columbus 16, Ohio.



MECHANIZE with Jeffrey machinery and save. Your materials-handling and power transmission equipment will give more efficient, economical operation if you employ time-tested, dependable Jeffrey products.

JEFFREY

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Circle 595 on Page 51

FOR QUALITY THAT STANDS CLOSE INSPECTION

Husky performance features of this Sydney Lathe with 6" spindle typify pattern production facilities at Pyle. Unusual range of equipment in the skilled hands of veteran personnel assures fast, smooth flow of patterns to meet specifications as well as shipping dates.

. . . we suggest you look to Pyle! Our business has been built serving customers who accept nothing less than perfection.

Here every wooden model is prepared in flawless detail by men averaging 19 years of patternmaking experience. Our integrated foundry is designed, equipped and operated exclusively for pattern production. We have the lathes, radial drills, milling machines, planers and hydraulic or automatic duplicators to meet your every need. Meticulous hand finishing and uncompromising inspection guarantee your complete satisfaction.

For fifty years we've made patterns for America's most quality-conscious firms. May we have the pleasure of making them for you?

PYLE

PATTERN AND MANUFACTURING COMPANY

Muskegon Heights, Michigan

Circle 596 on Page 51

"Why are more and more foundries taking advantage of Knight Engineering Surveys?"

"Because **Knight's specialized foundry engineering experience** and independent, professional approach represent valuable counsel to management."

Knight services include:

Foundry Engineering
Architectural Engineering
Construction Management
Organization
Management
Industrial Engineering
Wage Incentives
Cost Control
Standard Costs
Flexible Budgeting
Production Control
Modernization
Mechanization
Methods
Materials Handling
Automation
Survey of Facilities
Marketing

Knight Engineers are well qualified to analyze foundry operations and recommend methods, processes and machines. The Knight organization has successfully completed more than 350 assignments in every type and size of foundry. Surveys are made impartially, considering only facts and economical solutions—not influenced by other responsibilities to management or an interest in equipment sales. Call us for a preliminary discussion of how a Knight Foundry Survey can help you.

Lester B. Knight & Associates, Inc.

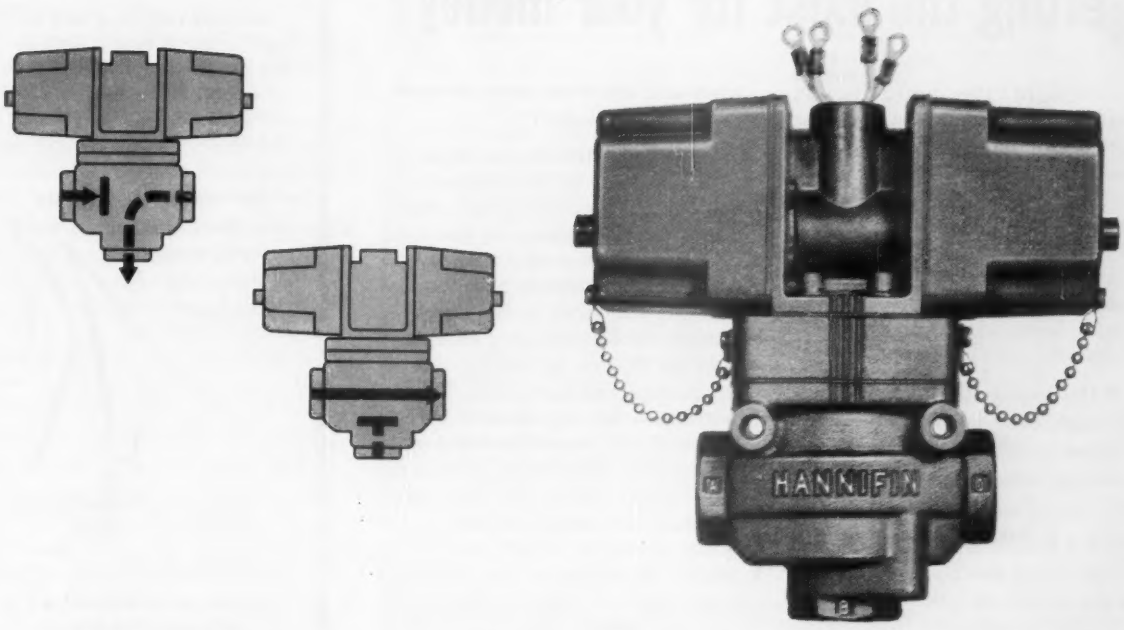
Management, Industrial and Architectural Engineers

Member of the Association of Consulting Management Engineers, Inc.
549 W. Randolph St., Chicago 6, Ill.
917 Fifteenth St., N. W., Washington, D. C.
New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16

Circle 597 on Page 51

Setting the pace for automation

...Hannifin valves



Automatic processes call for speed, sensitivity and flexibility in directional air control. Above all, they demand dependability. That is why so many valve users find it pays to choose Hannifin.

Every feature that contributes to dependable performance has been incorporated in Hannifin air control valves. This dependability is the result of never-ending research and development.

In the broad Hannifin line, you will find valves with new exclusive features... valves for practically any kind of automatic sequential operation. All are simple in design, with few and easily replaceable parts.

AIR CONTROL

HANNIFIN

VALVES

For this complete catalog showing all the Hannifin directional air control valves, write to Hannifin Company, 637 South Wolf Road, Des Plaines, Illinois.

Circle 598 on Page 51

(Advertisement)

International Minerals & Chemicals

A REPORT TO FOUNDRIES

What makes you think you are getting the most for your money?

With freight rates increasing continually, the foundryman becomes more aware that his delivered cost of Bondclay or sand binders is the important cost. There might have been an excuse once for buying materials diluted with sand or water or some other cheap material. Today, however, the cost of transporting impurities is frequently greater than the cost of the material itself.

If this sounds like beating around the bush, consider the fire clay type binders such as Revivo Bond. The same situation would exist for fireclay itself since fireclay is essentially a lower swelling binder.

The word fireclay, unfortunately, is not specific as a descriptive word. Fireclay can represent anything from a strong molding sand up to the maximum purity as represented by Revivo. The following table shows 10 different "fireclays" from a low of 29.2% clay to a high of 75.2% clay.

PRODUCT	Bouyoucos Colloidal Test			Green Compression
	Sand or Silt	Silt or Clay	Clay	
Revivo Bond	5.0	19.8	75.2	7.36
Eastern Ohio A	19.2	38.8	42.0	5.09
Eastern Ohio B	15.2	21.6	63.2	5.63
Northeastern Ohio	24.2	40.6	35.2	4.05
Southern Ohio	11.4	21.8	66.8	5.72
Western Penn.	36.0	38.2	35.8	4.50
West Virginia	42.4	28.4	29.2	3.39
Northern Illinois	22.0	35.2	42.8	3.82
Southern Indiana	9.2	40.8	50.0	5.42
Kentucky	11.8	43.4	44.8	4.41

The percentages in this table for sand, silt and clay cannot be used as specifications because there are variations in any naturally occurring product.

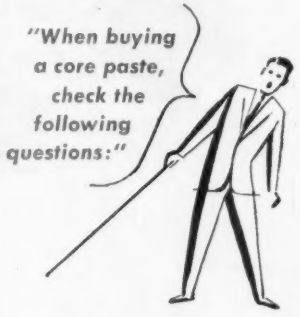
If a fireclay bond is composed of clay, silt, and sand, doesn't it make sense to buy pure clay, the strongest you can get, and introduce your sand and silt from some cheaper, lower freight source?

Usually the difference in delivered costs is sufficient to demonstrate the value of a dependable steady source such as Revivo. There are also some technical reasons for using pure clays. Many foundries have found a distinct difference in the scabbing tendencies of sands using pure clays such as Revivo as compared with sands using less pure clays. The impurities in the clay tend to stay in the sand and eventually build up to undesirable proportions. The more impurities there are, the more chances there are of introducing organic materials which completely change the expansion and refractory characteristics. Actually, fireclays or fireclay bonds may be as low as 2400°F. for the refractoriness rather than being around 3000° as in the case of Revivo Bond. The lower sintering temperatures in these materials can have quite an effect, particularly for the producer of heavy iron or steel castings.

Take a look sometime at the ASTM standards on fireclays. You probably will be surprised to find such a wide variety of materials sold under the same name. This is not because anyone is misrepresenting; the word "fireclay" is actually not a more accurate description than the words "steel" or "grey iron." A customer, for example, will send in blueprints for the castings they want and specify "grey iron." You could ship them anything from 10,000 pounds up to 70,000 pounds tensile. For some uses, the 10,000 pounds tensile might be adequate but we claim that in the case of fireclay, where a good part or most of your cost is in the freight rate, it is cheaper to buy the best you can obtain.

CORE PASTE QUIZ

Core paste may be a very insignificant or minor item in the overall purchases made by a foundry. However, to the man using the paste, it is a major factor.



___Does it mix smoothly and quickly with water?

___Is it gummy?

___Can it be applied by spraying, brushing, or dipping?

___Does it develop strength by either air drying or oven drying?

___Does it creep or seep from pasted joints?

___Does it expand or contract appreciably on drying?

___How strong is the paste?

___Is it sensitive to temperature?

___Is it stable in contact with molten metal?

Try this check list on your present core paste and then let us send you a sample of Revivo Core Paste.

Check the Revivo Core Paste against the same check list, compare the cost, and we will stand or fall on your decision.

Your Eastern Clay District Sales Manager is a technical expert, as so many of you know from experience. He knows foundry operating problems and how our products can improve efficiencies and cut costs.

You in the central area who work with Bill Adams may wonder how it is that he seems to be so familiar with foundry operations. Here's why.

For a young man, Bill is an old foundry hand. Except for war-time service as a 1st Lieutenant of Infantry in the Philippines, Bill worked with Albion Malleable Iron Company in Albion, Michigan from 1939 until he joined Eastern Clay in 1952 as a sales and service engineer.

He worked at Albion in the sand and metallurgical laboratory and on refractory repair of furnaces and cupolas while at Albion College.

Albion Malleable grabbed him when he got out of the army and put him in the office on accounting, methods, industrial engineering and sales work. He also made general surveys involving annealing and cleaning methods.

Then, as Bill says, he really went to work—in the shop as a cupola operator. He became furnace operator and then melting foreman. Later he was made mold foreman, molding line foreman, annealing foreman and eventually moved back to melting as general foreman.

We at IMCC are proud of our sales staff, of our men, such as Bill Adams, who know foundry operations from long, practical experience and for that reason can be so helpful to foundrymen who depend on them for IMC materials and equipment.

The NEW CUPOLINOR

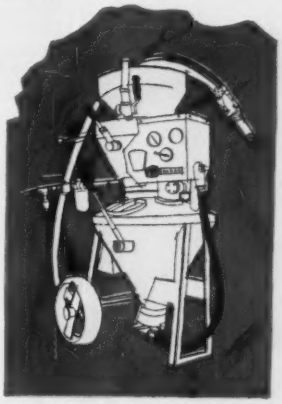
When we introduced the idea of gun patching nearly 10 years ago, we didn't realize how extensive the practice would become. At the 1948 convention in Cleveland, the new Bondactor was the hit of the show because it was a brand new conception. Today, it is run of mill but there are exciting new developments well worth reporting to you.

In literally hundreds of foundries, nothing is considered superior to a Bondactor machine. Yet, today, we have a machine that is even better; we call it the Cupolinor 1500. It is more than just a "deluxe" gun for the long run or multiple installation foundry. It is faster, more durable and simpler and easier to run.

The basic, successful principles of the Bondactor remain unchanged. However, mechanically, the machine has been literally turned upside down, enlarged and structurally strengthened. Most of the manual operations have been combined mechanically for automatic performance. As a result, the operation is simplified and streamlined.

If you think the 1958 automobile is an improvement over a 1948 automobile, you should see the improvement that we have made in refractory guns in the same length of time. We are proud to be the first to bring you a refractory gun and we are proud to offer you now the modernization and know-how based on 10 years of experience with hundreds of machines operating in hundreds of foundries.

Would you like a copy of our bulletin "Patching with Cupolinor"?



Mission Accomplished

We were talking the other day about the rapidly increasing use of Plasti-Bond and its many interesting and sometimes unique applications in almost every kind of foundry.

A foundry specializing in heavy grey iron castings of a scabbing design desired to 1) reduce casting weight, 2) reduce number of sands, 3) reduce or eliminate skin-drying and baked molds. The sand fineness was changed from 53 AGF to 68 AGF with Black Hills Bentonite, Maplex, and Plasti-Bond. The mission was accomplished quickly.

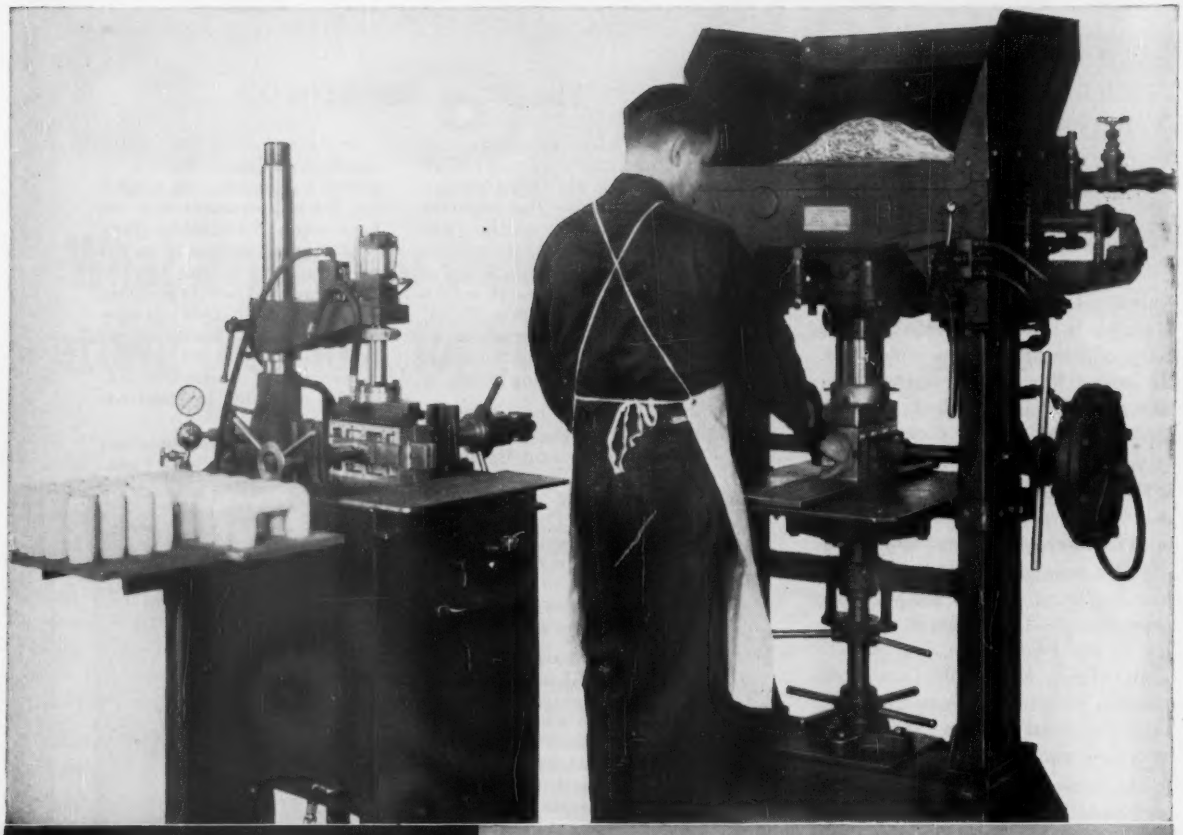
DURA PRODUCTS

It is surprising how many people put up with sand blowing in their face from the core blowers when the use of Durastrip or Durarod would not only eliminate this blow-by, but reduce costs. Every time the sand blows out at the parting line of the core box used on a core blower, there is excessive wear. No metal can withstand this abrasion. The only complete cure is to eliminate it before it starts and the best way to do that is with Durarod or Durastrip. Get the story in our booklet, "If You Operate a Core Blower."

International Minerals & Chemicals

EASTERN CLAY PRODUCTS DEPT.
INTERNATIONAL MINERALS & CHEMICAL CORPORATION
20 NORTH WACKER DRIVE, CHICAGO 6 • PHONE: Financial 6-1800

Circle 599 on Page 51



Redford

NO. 4 CORE BLOWER with AUTOMATIC CO_2 CORE HARDENING STATION

The *right tools* to assure uninterrupted production if you make cores by the CO_2 Process.

One core box is being blown while another one is automatically clamped, the cores hardened in the core box and the core box released ready to remove finished cores. If core boxes are suitable, cores can be mechanically stripped as shown in the picture at the right.

The Core Hardening Station is completely air operated. Automatic time cycle is quickly adjusted to meet job requirements.

Whether you blow cores with conventional sand mixtures or use the new CO_2 Process, REDFORD equipment gives you the *best* in over-all performance.

Redford IRON & EQUIPMENT CO.
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

Make Iron Ductile with Magnesium Ferrosilicon

Mg

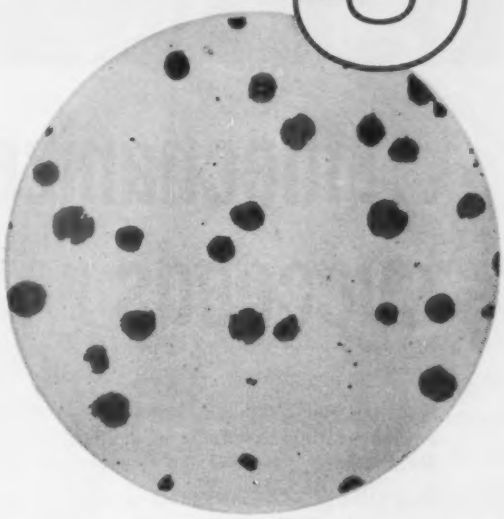
The microstructures shown at the right illustrate how an addition of magnesium converts flake graphite to a spheroidal type and is the key element in the production of "ductile" or "nodular" iron. An economical and convenient source of magnesium for these irons is ELECTROMET magnesium-ferrosilicon. This ladle-addition alloy can be added to iron made in either the cupola or electric furnace and is available in three grades, including 0.5 and 2 per cent cerium-bearing grades. Cerium neutralizes certain elements which inhibit the formation of spheroidal graphite. All three grades contain 1.00 to 1.60 per cent calcium which intensifies the spheroidizing action of magnesium.

To obtain the best combination of ductility and freedom from chill in light sections, the magnesium-ferrosilicon addition is usually followed by a post inoculation with ferrosilicon. ELECTROMET calcium-bearing 85 per cent ferrosilicon is an improved grade used by many ductile iron foundries.

For further information and technical assistance, contact ELECTROMET, supplier of alloys for gray, ductile, and malleable iron.

ELECTRO METALLURGICAL COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Toronto.

Offices: Birmingham, Chicago, Cleveland, Detroit, Houston, Los Angeles, Phillipsburg, N. J., Pittsburgh, and San Francisco.



Note in the top micrograph how the graphite flakes break up the continuity of the gray iron matrix, causing low strength and brittleness. In the bottom micrograph, the addition of a small amount of magnesium has changed the graphite structure from flake to the spheroidal type which has less effect on the continuity of the matrix. This "ductile" or "nodular" iron structure is therefore stronger, tougher, and more ductile.

Electromet
FERRO-ALLOYS AND METALS

UNION CARBIDE

NOTE: Since patents cover the use of magnesium in the production of ductile iron, we suggest that you investigate how these patents might affect you.

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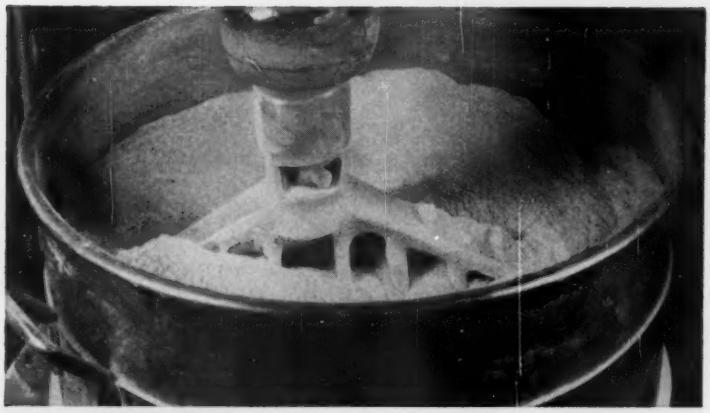
Circle 601 on Page 51

From start...



To finish...

...mechanized shell molding succeeds with a BAKELITE resin

From the time BAKELITE Phenolic Resins and sand are mixed, until the castings are produced, shell molding at Walworth Co., South Boston, Mass., is almost entirely mechanized.

This plant pours about 12 tons of metal per day—brass, Navy composition "M", stainless steels, and medium and low carbon steels. BAKELITE Brand Phenolic Resin BRP-5012 is used because it "meets Walworth's rigid requirements and is of controlled quality." Close tolerances are held—in general, .003-.005 within the shell and .010-.013 across a parting line.

Whatever your own shell molding requirements, there is a BAKELITE Brand resin to meet them. Bakelite Company produces a variety of shell molding resins and, in addition, provides technical assistance. As a pioneer manufacturer of shell molding resins in this country, Bakelite Company has a wealth of experience to put at your service. For information, write Dept. **BG-71.**

BAKELITE
BRAND
PLASTICS

UNION CARBIDE

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.

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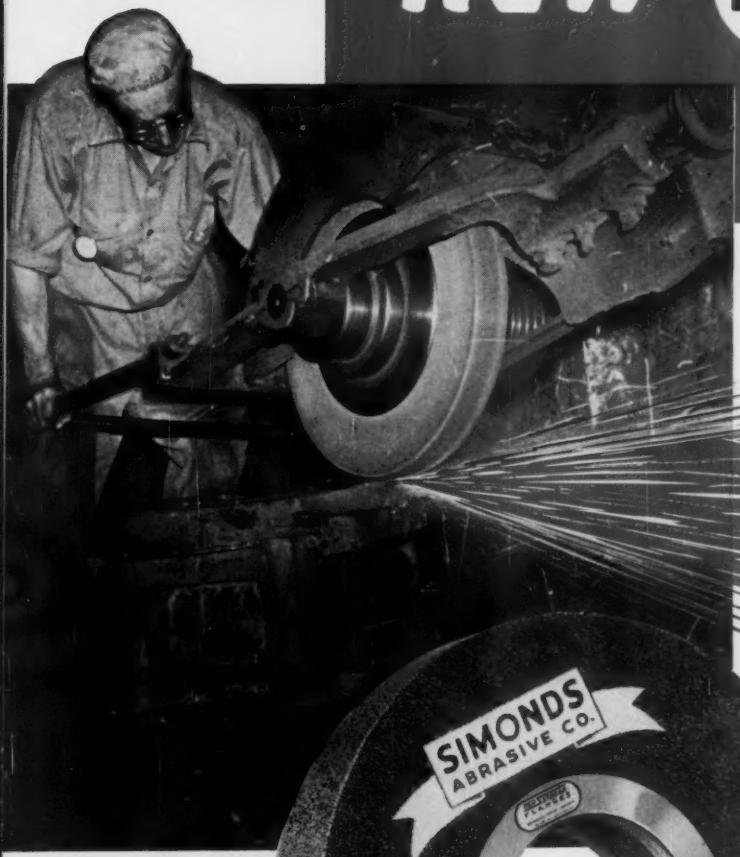
Circle 602 on Page 51

SIMONDS
ABRASIVE CO.

NEW IL BOND
Snagging Wheels



MAKING SMOOTH GOING OF ROUGH GRINDING

For rough snagging on swing frame, floor stands and portable grinders.

The life of a hard grade, plus the fast free-cutting of a soft grade! Every Simonds wheel made with new IL Bond has this ideal combination — because of the unique internal lubricating action of this new Bond — another Simonds improvement to bring you the best in grinding wheel performance. Write for Snagging bulletin ESA 62.

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SIMONDS ABRASIVE COMPANY

Tacony & Fraley Sts., Philadelphia 37, Pa.
Division of Simonds Saw and Steel Co.

BRANCHES: Philadelphia • Chicago • Detroit • Shreveport • Los Angeles • San Francisco • Portland, Ore.

Circle 603 on Page 51

They're Pouring Strength, Machinability,

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

Wear-Resistance with CHATEAUGAY PIG IRON

East Akron Casting Company, Tallmadge, Ohio, has built a solid reputation as a jobbing foundry by using Chateaugay Pig Iron. They have found from over 70 years' experience, that there is no better nor more economical means for providing their customers with strong, flaw-free, easy-to-machine castings.

The wire drawing drum, shown left, is typical of the quality castings produced by the company. Requirements on this particular job call for unusual strength, a high degree of machinability, and maximum resistance to wear. Chateaugay fills the bill on every count.

Chateaugay Pig Iron is produced at Troy, New York, entirely from New York State ores. Its properties and characteristics are unequalled by any domestic pig iron. It is a low-phosphorus, copper-free iron. The highly uniform distribution of chemical elements produces a fine, dense grain structure throughout every casting. This results in excellent and economical machining—plus exceptionally high strength and wear-resistance.

Chateaugay's other superior characteristics make it ideal for a wide variety of applications. It flows freely—fills adjoining light and heavy sections completely—cools evenly. A very high carbon, and unusually low sulphur, phosphorus, and manganese content make it the perfect iron for ductile use.

A Republic Pig Iron Metallurgist will give you the full story about Chateaugay and other Republic Irons. Republic, as the only producer of both Northern and Southern Irons, offers industry's only complete line of all grades of merchant pig irons. Northern grades include Malleable, Bessemer, Foundry, and Basic. Southern furnaces produce Foundry and Basic Irons.

Mail the coupon for metallurgical service and for more information on Republic's complete line of irons.

STRONG, HEAVY-DUTY PB-127 COLLAPSIBLE BOX AND SKID UNITS help solve a costly handling problem. Incoming shipments are handled up to 10 times as fast. Storage space requirements are reduced 66%. Units can be tiered loaded or empty—collapsed or set up. Collapsible feature reduces transportation costs. One-piece design. All parts permanently attached. Write for details.

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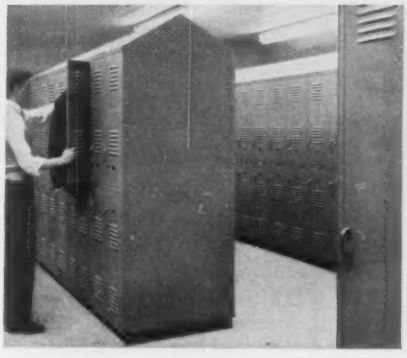

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Circle 615 on Page 51

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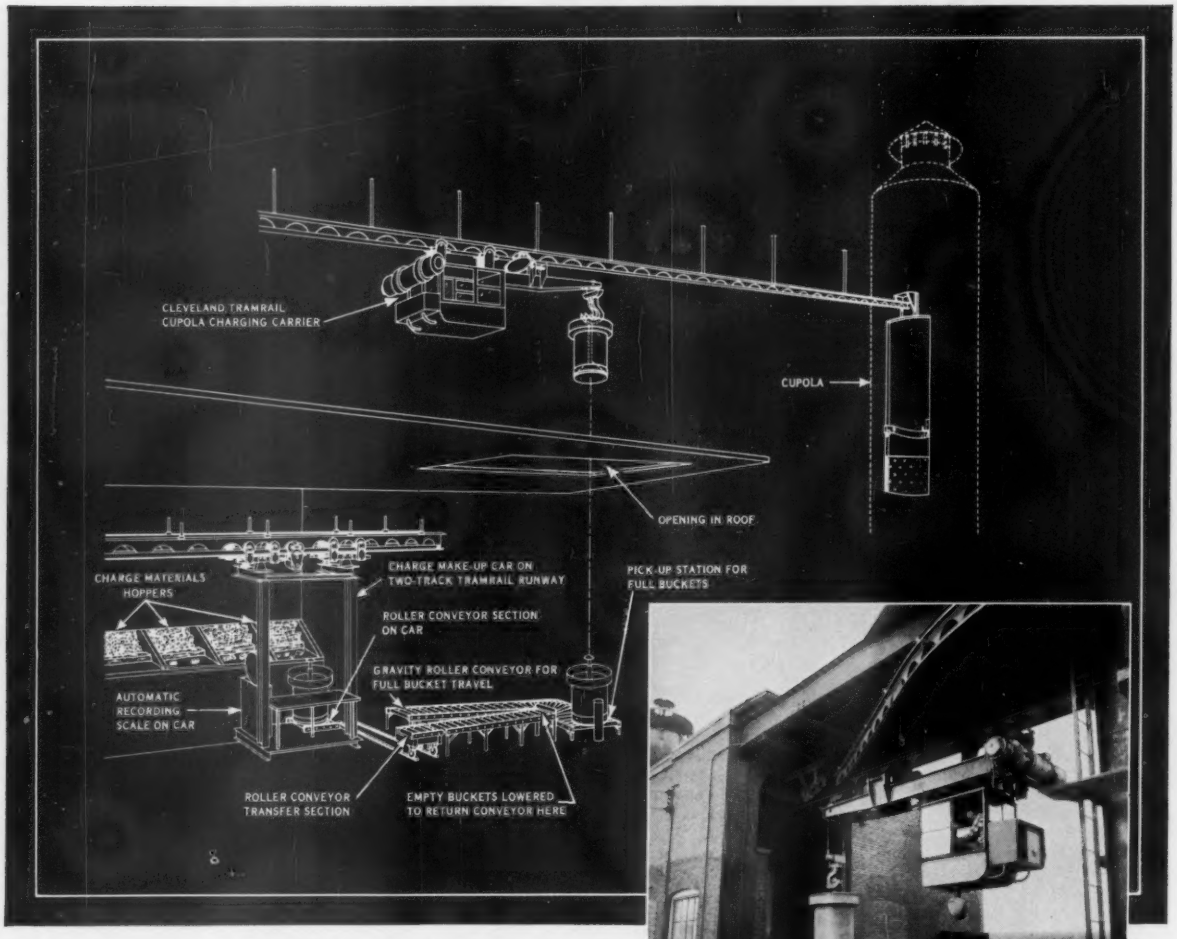

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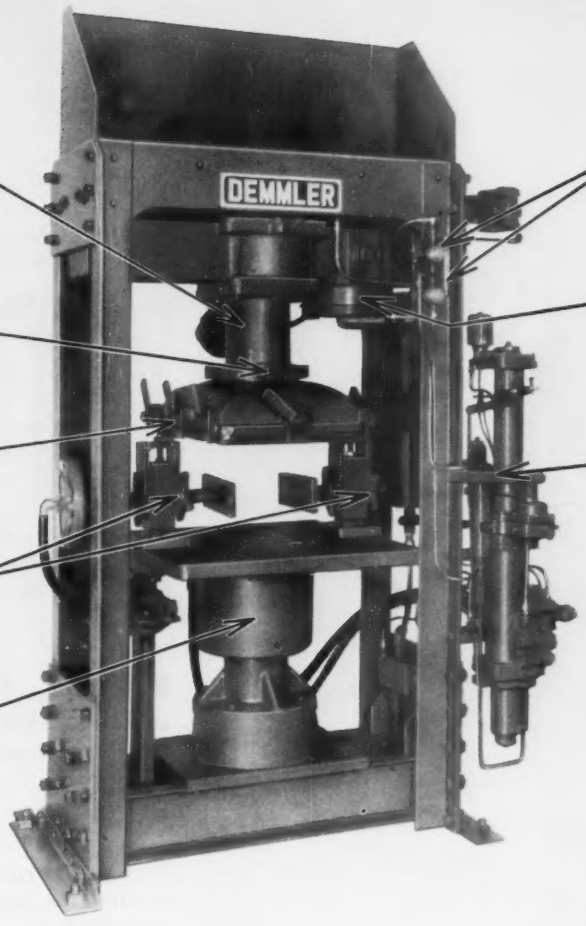

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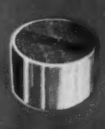

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Circle 605 on Page 51

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Circle 606 on Page 51

Circle 607 on Page 51→

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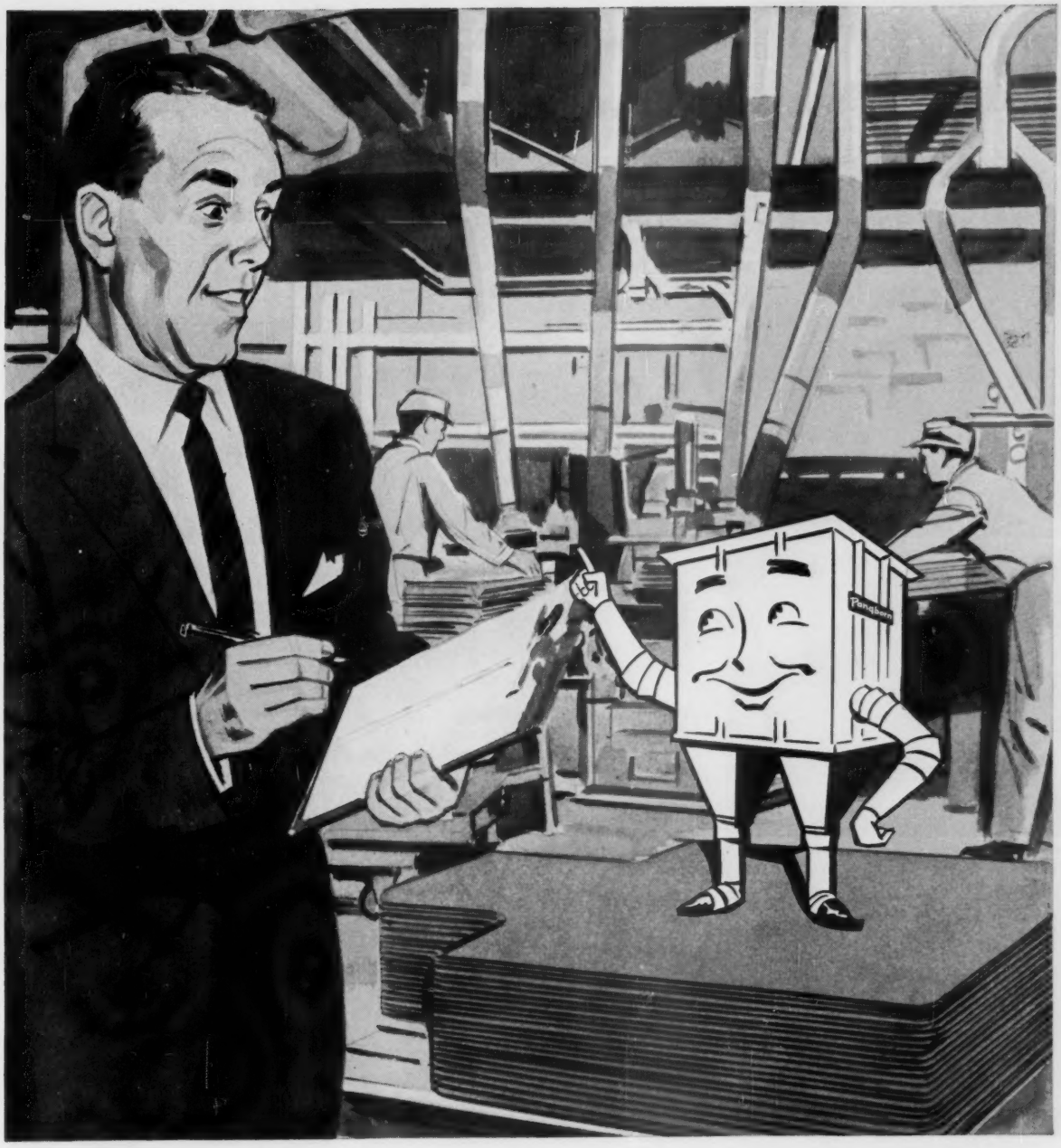

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Circle 610 on Page 51

Readers' Comment

More on Making Bells

TO THE EDITORS:

The September, 1957 issue of FOUNDRY page 182 carries a plea for historical references to the casting of guns and bells.

During my visit this summer with the Centre Techniques des Industries de la Fonderie in Paris, I learned a historical book on this subject is kept in a reference file, which might be called a reverence file, describing 16th and 17th century practice for the melting and casting of guns and possibly bells. These shops made one or the other. The Director of the Centre, Georges Blanc, calls attention to the ancient practice of treating the bronzes with saltpeter which exerted some purification effect on the material.

I am sure additional information on this detail may be obtained by applying to Mr. Blanc.

J. S. VANICK
The International Nickel Co., Inc.
New York 5, N. Y.

Big Aluminum Castings

TO THE EDITORS:

I read with considerable interest your article in the October issue on "Big Aluminum Castings." Our foundry has recently been casting some mighty large aluminum castings (although not as heavy as those you discuss). We are becoming more interested all the time in the problems of casting sections with a thickness greater than a foot with good physicals throughout.

The reason for my letter, however, is that it seems odd that you did not mention that the tread ring castings shown both on your front cover and in your article proper were made by Morris Bean & Co. here in Yellow Springs, Ohio. Enclosed is a copy of our publicity release of about two years ago which announced the first of these large rings.

D. E. SCOTT
Morris Bean & Co.
Yellow Springs, Ohio

More on the Tensile Test

TO THE EDITORS:

The author appreciates Mr. Cameron's discussion (Readers' Comment, December, Page 66), for the article in question was written with this point in mind—to stimulate discussion on this topic. It must be admitted that the rather arbitrary style of presentation was for that end.

Mr. Cameron's example goes right to the heart of the discussion. His tension test bars show practically the same yield and tensile strength regardless of the ductility values. The important point is not to jump to the conclusion that tensile elongations and reductions of area lower than expected from present specification requirements are, in themselves, indications of "brittleness." In the example given by Mr. Cameron the *change* in elongation is probably significant. When tensile elongation is used in this way, as a control, it is a useful tool if used correctly. If the tension test bar is taken from another casting, however, or from another location on the same casting, would a similar decrease in tensile elongation be an indication of "brittleness"? The answer is emphatically no!

Just as high tensile ductility does not insure "toughness," low tensile ductility (over a few per cent elongation) is not an indication of "brittleness." Other tests are needed, for the testing is now for evaluation, not control. There is much evidence, both published and in the file, that more than adequate "toughness," as measured by notch and fatigue tests, is present in castings with tensile elongations and reductions of area lower than has been taught as being adequate.

Mr. Cameron implies at least an even more important point. To quote: "After all, the purpose of any test is not to get the casting accepted, but to demonstrate its adequacy for the intended application." Why is it that when the foundryman suggests a change, the man on the other side of the desk immediately jumps to the conclusion that the foundryman is only trying to get some casting accepted. Admitted that the foundryman is not blameless in these situations, he is not totally at fault! The author's reaction is that more selling by the foundryman is needed.

To be specific (the question is the type of notch specimen) the author advocates the Naval Research Laboratory brittle weld bead specimen for the determination of notch toughness. This test is actually more severe than the Charpy V notch, for the notch is much sharper and the specimen many times larger than the Charpy specimen. The size of this specimen eliminates one chief objection to the Charpy test, for it is difficult to say when a 0.394 in. square specimen is representative of the metal in even a small part. These are advantages to the consumer.

The Naval Research Laboratory

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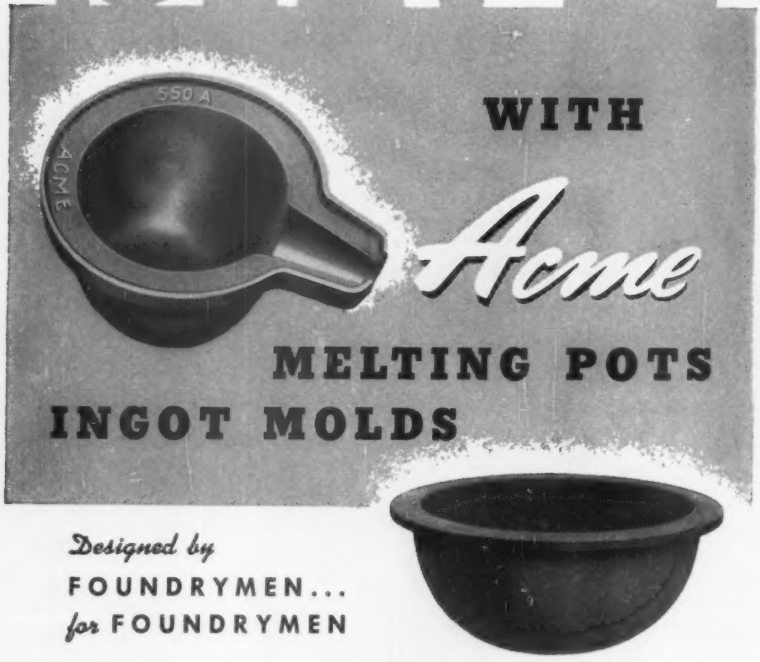

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specimen has advantages for the foundry in that the specimen is tested with cast surfaces. No machining is necessary. The only apparatus needed for sample preparation is an arc welder. Compare this to the elaborate toolroom equipment needed to machine the Charpy specimen correctly. There is not one foundry in a hundred that has this toolroom equipment. This is the chief reason that the average foundry shies away from notch testing and specifications involving such tests.

Selling such a change is more than merely trying to get some castings accepted. It is a change that would be of benefit to all parties concerned.

Everyone would gain, no one would lose. The only catch is that, with this test, the results must be reported in degrees of temperature.

The author must plead guilty to the omissions mentioned in the last two paragraphs of Mr. Cameron's discussion. His only excuse is that the article was getting too long. A detailed discussion of the advantages of lack of directionality and of fatigue properties of not only steel castings, but castings of most metals, is very feasible if there are enough men like Mr. Cameron, with enough interest in the subject, to make the expenditure of ink and paper worthwhile.

JOHN B. CAINE

5 *Linden Dr.*
Cincinnati 15

•

TO THE EDITORS:

Allow me to compliment you again on an excellent article appearing in the November issue, "The Case Against the Tension Test," by John B. Caine.

In our commercial foundry operations we have successfully used the factors of casting characteristics that he so ably explains in this article. We have found many occasions in which the actual casting results exceeded the listed book values of both castings and other wrought material when the proper design and alloy were applied to the specific job.

We are actively engaged in another situation of this type and would like to obtain ten reprints of this article for distribution, as it eloquently supports our claims.

Again, my congratulations to FOUNDRY and Mr. Caine for this type of editorial material. In the very near future we may have additional material of value to you on this subject.

R. A. LAWSON
Vice President-Sales
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Changing the Trend

Although business forecasters see an expanding situation by 1960, they are having difficulties in predicting what will happen in 1958.

A year ago, economic experts and business leaders believed that volume in 1957 would match or exceed that in 1956. As the year progressed, however, the situation became spotty, with declines developing in some lines, including metalworking. Although production of castings was high compared with output immediately preceding World War II, the 1957 total of approximately 16,500,000 tons was slightly below the average of the last ten years. The lowest for that period was 13,700,000 tons in 1949; the highest was 19,251,000 in 1951. Three years ago —in 1954—shipments were only 14,531,000 tons.

Because some of the factors which contributed to the decline in business are changing, many believe that foundries can reverse the 1957 trend during the new year.

Federal spending will increase, especially in military procurement. Outlays by state and local government also are likely to continue upward. Capital expenditures by industry apparently will dip, but there are expectations of some improvement in residential construction, and first effects of the big highway building program will begin to be felt this year. Inventories of raw materials and finished goods are down, but a reversal in the industrial trend may be necessary before they start to expand. Easier money should help both construction and capital spending.

Steel's yearly study of "What Metalworking Management Expects," published in its Jan. 6 Metalworking Yearbook Issue, indicates that 49 per cent of those responding expect an increase in business during 1958, 28.6 per cent expect a decrease, and 22.4 per cent expect business to remain about the same. Only 5.1 per cent expect a decrease in 1957.

Other figures in this extensive study show that 29.4 per cent expect to have more workers on the payroll, 47.8 per cent expect an increase in selling prices, 72.2 per cent see an increase in unit cost of manufacturing, and 60.6 expect to increase their manufacturing capacity during the year.

Since Thanksgiving, reports from various centers have indicated some pickup in foundry orders. Foundrymen are beginning to feel that midyear or before should see a trend toward more satisfactory demand.

But the total tonnage of castings sold will not show the desired growth without a modern, aggressive marketing program on the part of individual foundries.

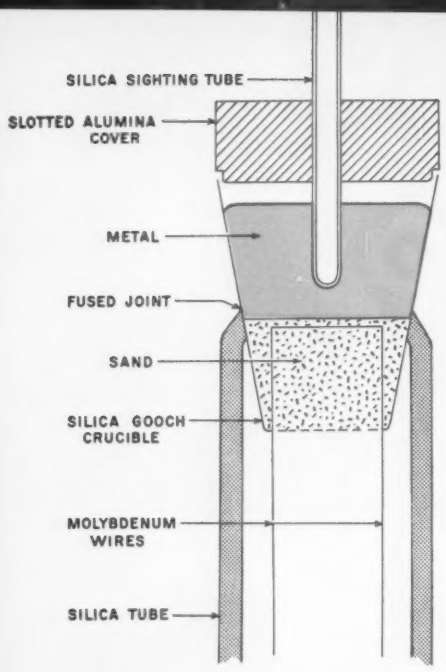
What the industry needs is more conversions to castings.

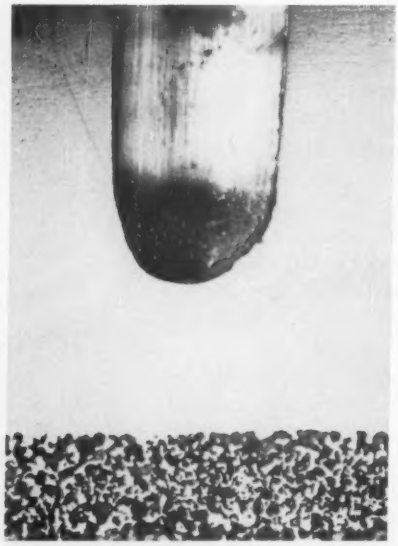
Frank G. Steinebach

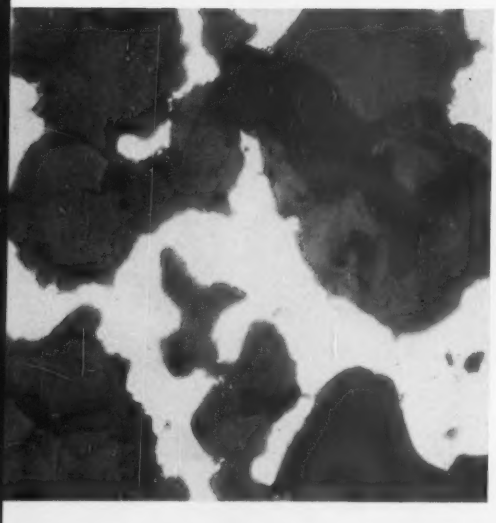
Editor

Factors Affecting the

SURFACE FINISH







BURNT-ON or adhering sand on steel castings always has been a problem. Cleaning costs generally are one of the most expensive items in the production of a steel casting, and castings often have to be scrapped because of difficulties in cleaning the surface. Consequently, the problem has stimulated a considerable amount of both practical and fundamental research, notably in Great Britain, the U. S. A., Canada, and Sweden.

These investigations have achieved considerable clarification of the processes that occur at the metal-mold interface and result in burnt-on sand. Some methods of improving the surface finish of castings have been suggested as a result of these researches, but no generally applicable or satisfactory technique has been found. There can be little doubt, however, that a more widespread appreciation of the factors involved and application in the foundry of the results of these researches can go a long way toward mitigating the burn-on problem.

These articles will present a general survey of research into burnt-on sand, with a critical review of factors affecting its magnitude and extent, including consideration of the many recent advances in molding materials and techniques. Most of the views put forward are based on work carried out in the Department of Metallurgy, University of Cambridge, England, by the author in collaboration with Drs. T. P. Hoar and D. H. Houseman. For the last ten years, investigations have been carried out there, under the general direction of Dr. Hoar, on various problems associated with steel founding, their focal point being the physical and chemical reactions occurring at the metal-mold interface.

Primary Influence on Surface Finish—Surface finish of a steel casting is influenced primarily by partial or complete penetration of molten steel into the pores between sand grains. Partial penetration —entry of the metal into the pores of the first layer of sand grains of the facing sand, but not

Fig. 1—Top, detail of apparatus for determination of penetrating pressure. Center, typical macrophotograph showing the type of penetration obtained with apparatus in the top drawing. Bottom, typical macrophotograph with detail of penetrated sand showing metal (light), sand (gray), and voids (black). Magnification is X150

By DAVID V. ATTERTON
Foundry Services Ltd.
Birmingham, England

# of STEEL CASTINGS

Burnt-on sand on steel castings always has been a pressing problem. This series of articles will survey research on the subject, review causes, and consider advances in materials and techniques

beyond—leads to a dimpled casting surface which is very acceptable. Complete penetration by molten metal through the interstices between the sand grains at the surface of the mold and beyond leads invariably to burnt-on or adhering sand on the surface of the casting. Its removal involves considerable time and expense.

It should be appreciated that, although adhering sand is generally most prevalent in steel foundries, metal penetration can occur with all metals. The severe penetration of phosphor bronze into sand molds is an outstanding example. A further illustration of penetration by nonferrous metals is afforded by the costly experience of one steel foundry which tried to cast a lead safe, using a steel sand-mix and, evidently, a generous superheat. The molding sand was penetrated completely by lead.

Diverse Theories Proposed—Many diverse theories have been proposed to explain metal penetration. Apart from a recent one based on volatilization, however, researches carried out independently during the last ten years generally agree on the main causes of penetration. Incidentally, the theory that volatilization is responsible for metal penetration appears improbable since penetration by many metals of negligible vapor pressure frequently is observed in practice, as described above.

What Causes Metal Penetration—Let us consider a simple explanation of metal considerations. based on elementary theoretical considerations. Molten metals do not wet the surface of sand grains; metals poured onto silica or other refractory oxides form discrete droplets or sessile drops, unlike water, which wets silica and penetrates a sand mold immediately on contact. If molten metals actually wetted silica, the conventional casting process would be impossible. The metal would penetrate the sand in exactly the same way the sea soaks into a sand beach.

Nonwetting means essentially that the forces of surface tension tend to prevent the molten metal from penetrating the pores between the sand grains. As a sand mold is filled with molten metal, however, the metal in contact with the sand is subjected to an increasing metal head or metallostatic pressure which, in certain instances, overcomes the surface tension and causes metal penetration by forcing the molten metal into the sand pores. Naturally, a large number of variables influence the magnitude of this critical head of metal or "penetrating pressure." For any particular sand, however, it is primarily the head of metal that determines whether or not penetration occurs.

The severity of burnt-on or adhering sand depends on the depth of metal penetration into the mold or core, but the factors which determine this depth are essentially different. Molten metal cannot penetrate into sand substantially beyond a point where the sand temperature is equivalent to the solidification temperature of the metal. It appears, therefore, that depth of penetration is determined by the location of the solidification-point isothermal in the sand at the attainment of the penetrating pressure.

The location of this isothermal depends on thermal variables such as pouring temperature of the metal, thermal conductivity of the metal and of the sand, temperature of the metal-sand interface, etc. All examples of metal penetration on production castings examined by the author have been found to be quite consistent with this simple theory, which will be substantiated in this paper by considerable experimental evidence.

Experimental Methods—Before considering the influence of numerous variables on the extent and severity of metal penetration and burnt-on sand, let us examine a brief description of the various methods that have been employed to investigate these defects.

1. Many foundrymen have conducted investigations dependent on visual examination and assessment of castings produced under a wide range of conditions. Perhaps the most notable investigation of this type was carried out by Ljunggren[2] in Sweden. Using a series of arbitrary surface-finish standards ranging from poor to good, he was able to find a definite correlation between adherence on the one hand, and permeability, mean grain size, and sintering point of the sand on the other, with sand adherence increasing with an increase in each of these three properties. These three sand properties are interdependent, and it was considered by Ljunggren that the true relationship is between adherence and permeability.

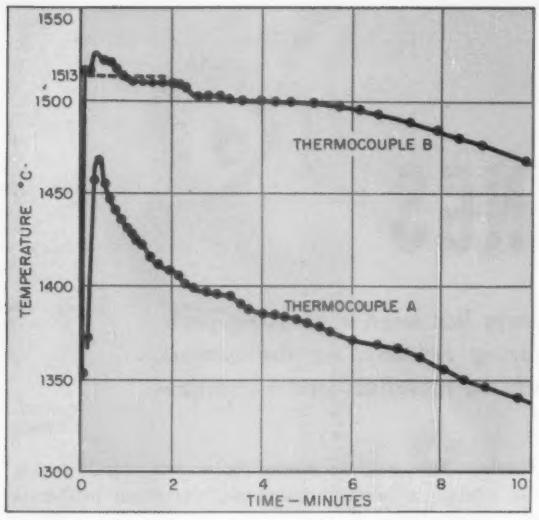


Fig. 2—Metal-mold interface temperatures on 280-lb steel casting using a sheathed thermocouple (A) and an intermediate metal thermocouple (B)

Another important investigation using a similar technique is that of Beeley and Protheroe.[3] They used a numerical assessment for metal penetration based on the maximum depth of metal penetration into the sand. This technique first was employed by Caine.[4] Their work emphasized the importance of thermal conditions to metal penetration. They found that below a certain pouring temperature, no penetration occurred and that this critical pouring temperature varied with sand grain size and permeability. As will be discussed later, their work gives considerable justification to the theory that the severity or depth of metal penetration is dependent essentially on the location of the solidification-point isothermal in the sand and consequently on thermal conditions at the metal-sand interface.

The main disadvantage of this technique, in which observations are made on production and experimental castings, is that the numerous variables concerned cannot be controlled to any great degree. In addition, observations on the castings are restricted primarily to the depth of penetration, which, as already mentioned, is only one facet of the metal-penetration phenomenon.

2. An apparatus for investigating the chemical reactions that occur at the metal mold interface was developed by Savage and Taylor.[5] These reactions certainly have considerable bearing on sand adherence. The technique consists of heating pellets of steel ½ in. in diam by ¾ in. high, embedded in cylindrical sand specimens, by high frequency induction. The specimen can be kept in a molten condition for an indefinite period under a controlled atmosphere. Since the metallostatic pressure is negligible, however, penetration phenomena cannot be examined by this technique.

3. The author, in collaboration with Dr. Hoar,[6] developed a method whereby a ¼-lb metal specimen is melted over a standard rammed sand specimen. By applying gas pressure to the upper surface of the molten metal, one can obtain metallostatic pressures of 1 atmosphere, equivalent to the pressure at the metal-mold interface in a steel casting about 5 ft high. With this apparatus (Fig. 1), both chemical reactions at the interface and penetration reactions can be investigated quantitatively under well controlled conditions. Penetrating-pressure values can be determined by the location of two fine contact wires in the sand, just below the metal interface. When penetration occurs, an electrical contact is made between the two wires. From observations of the gas pressure above the metal surface at this instant, the penetrating pressure can be calculated.

4. A simple technique, but one probably capable of less precision than method 3, was developed by Pettersson[7] for investigating steel penetration into sand cores. A large number of small-diameter cores are threaded together on a steel rod to form a continuous core about 20 in. long. This core is immersed into a crucible of molten steel to a known depth, held there for a fixed period of time, and then withdrawn. A cross section of the core then enables the penetrating pressure to be determined directly as the depth of metal below which metal penetration has not occurred. In addition, the type and extent of penetrating and chemical reactions at the interface can be investigated by this technique.

5. Caine[8] developed a dip technique similar to that employed by Petterson. Four brads are welded to the corners of a nut, and a standard AFS compact is rammed around this nut. The assembly then is immersed partially in slagfree molten metal

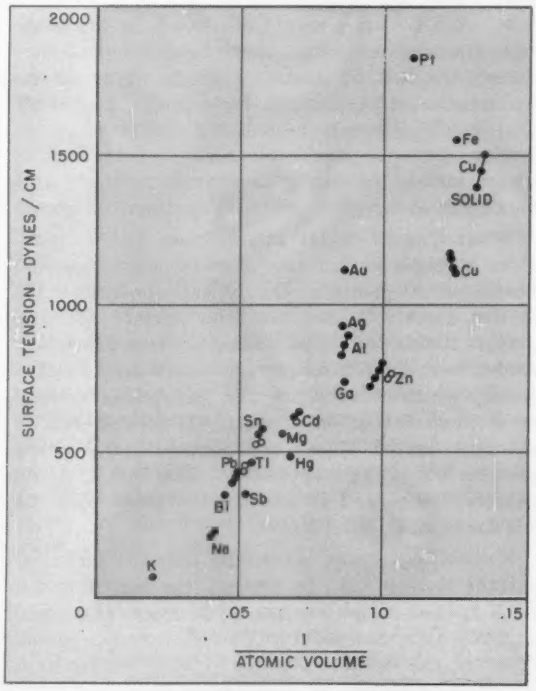


Fig. 3—Variation of surface tension of molten metals with reciprocals of their atomic volume

and can be subjected to conditions similar to those existing at the metal-core interface during pouring and prior to solidification.

6. Comparatively recently, the author, in conjunction with Hoar and Housemann,[9] developed a simple technique whereby standard rammed specimens are inserted in a sand mold at definite points corresponding to known metallostatic pressures. The degree of absence of metal penetration can be assessed on the resultant casting. The specimens are inserted in the following manner: A cork borer, of the same diameter as the standard specimen, is inserted in the mold face to the depth of the specimen. It is given a sharp twist which fractures the sand and allows it to be withdrawn intact. The specimen is inserted in the resultant cavity and sealed around its periphery with a mold coating.

The technique has the advantage of being extremely simple in use and enables a large number of variables to be investigated systematically on one casting; in addition, semiquantitative values of penetrating pressure can be obtained. This technique also has been employed to investigate the surface density of molds produced on a range of moldmaking equipment. By weighing thin slices of known volume of the sand removed from the mold in the cork borer, one can determine surface density and density gradients at various parts of the mold.

7. The American Foundrymen's Society[10] has laid down a tentative standard technique for assessing the metal-penetration resistance of a sand. This method assumes that metallostatic pressure is the controlling factor in determining metal penetration. A cored sprue, runner and ingate of 1¼ in. feeds the metal into the bottom of a mold cavity. Four test cores, each 1⅛ in. in diam by 2 in. high, double-end rammed, with core prints ½ in. deep, are spaced equally around the ingate. The centers of the cores are on a radius 1½ in. from the center of the ingate. The casting is 5⅞ in. across the bottom face and 6 in. across the top. The height is varied according to the metallostatic pressure required. A circular conical core is placed in the top face of the casting to facilitate atmospheric feeding.

Mechanism of Metal Penetration—Let us now utilize the results of various researches to build up an over-all picture of the reactions that take place during the pouring of a steel casting and lead to metal penetration and adhering sand.

When molten metal enters the molds through the ingate, it is chilled as it comes into contact with the mold surface, and a thin layer of metal probably solidifies. Whether remelting of this solidified layer occurs depends mainly on superheat of the metal, size of the casting, and thermal diffusivity of the mold sand. The thermal diffusivity is equal to the thermal conductivity divided by the product of the density and specific heat. If remelting does not take place, no metal penetration can occur, but the casting surface probably will exhibit cold-lap formation. Generally, however, this layer of solidified metal remelts because the heat input from the incoming metal exceeds heat absorption by the molding material.

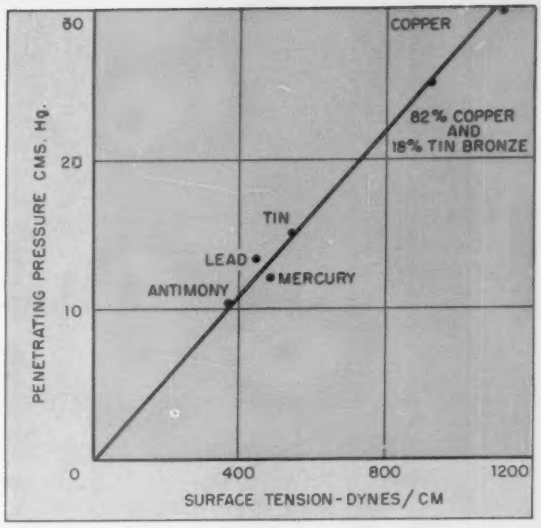


Fig. 4—Relation between the penetrating pressure and surface tension of the molten metal

Metal-Mold Interface Temperature—Numerous efforts have been made to determine the temperature at the metal-mold interface during the early stages of casting. Many of the published results[3] suggest that the interface temperature in steel castings is several hundred degrees below the liquidus temperature of the metal. This most improbable and inexplicable result probably is due to experimental error as a result of the use of sheathed thermocouples. The author, in collaboration with Houseman,[11] developed the technique of using an intermediate metal thermocouple for measuring the temperature exactly at the interface. This technique has given reproducible results in line with theoretical expectations.

Essentially, the technique involves the insertion of two thermocouple wires, generally platinum and platinum-rhodium for steel castings, through the mold so that the two separate wires protrude approximately ¼ in. into the mold cavity. On entry of the molten metal into the mold, contact between the two wires occurs, and temperature readings can be obtained. The molten metal acts essentially as an intermediate metal and does not invalidate the thermocouple readings in any way. In addition, the location of the junction of the thermocouple must *per se* be exactly at the interface. It also has the advantage of being of negligible heat capacity so that a very rapid response to temperature is obtained.

Some typical results obtained on a 280-lb steel casting[11] are illustrated in Fig. 2. For comparative purposes, results obtained with a sheathed thermocouple shows a short arrest initially at the liquidus same casting, are also shown. The intermediate couple shows a short arrest initially at the liquidus temperature corresponding to the remelting of the initial chilled layer of metal. Because of the heat

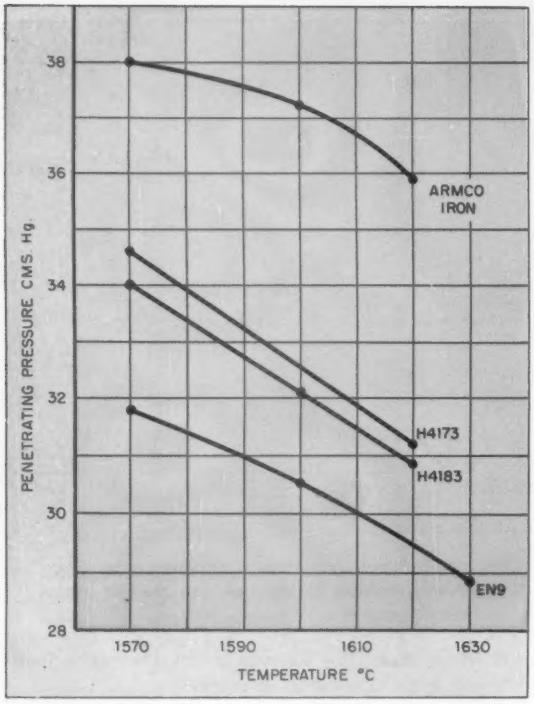


Fig. 5—Variation of penetrating pressure with temperature for steels of varying carbon contents: Armco iron, 0.012% C; H4173, 0.27% C; H4183, 0.30% C; and En9, 0.55% C

mass of the oncoming liquid steel, poured at a temperature of 1580° C (2875° F), the interface temperature then rises to 1527° C (2780° F), and the metal at the interface remains molten for 50 seconds. The temperature achieved at the interface and the time for which the metal is molten are of considerable importance in determining the depth of metal penetration.

If we assume the general fact that remelting of the chilled layer takes place, filling the mold with steel results in a steady increase in the ferrostatic pressure at the interface. In certain instances, depending primarily on the type of sand and its degree of compaction, the penetrating pressure is achieved. At this stage, the pressure of molten metal is sufficient to overcome the surface tension forces, and molten metal enters the pores between the sand grains.

Depth of Penetration—It previously has been suggested that the rate of entry of molten metal into the pores is limited by the viscosity of the penetrating metal. It may be shown readily by simple theory, however, that metal penetration is extremely rapid, of the order of 3 in. per second, and that viscosity of the penetrating metal is not a limiting factor. Naturally, penetration rarely takes place to depths of more than a fraction of an inch; the molten metal cannot penetrate substantially beyond the isothermal corresponding to its solidification point or liquidus, and for most molds poured at a reasonable superheat, this isothermal generally is only about ⅛ to ¼ in. behind the interface. For cores and re-entrant angles, however, where thermal conditons generally are more severe, penetration to depths of several inches frequently occurs.

Before we discuss the depth of penetration, considerable attention must be given to factors affecting the value of the penetrating pressure. It is well known from surface tension studies that the pressure required to force a liquid into a capillary that it does not wet is shown by $p = -2\sigma \cos\theta/r$, where p dyne per square centimeter is the pressure, σ dyne per centimeter is the surface tension of the liquid, θ is the contact angle that the liquid makes with the solid, and r per centimeter is the capillary radius. Consequently, it is expected that for a compacted sand, the penetrating pressure is determined by the surface tension of the molten metal, its contact angle with the molding material and the "effective" pore radius of the sand. The first two of these variables are fundamental properties of metal, and the foundryman has no control over them. Nevertheless, consideration of their magnitude and variation in the casting operation helps us to understand penetrating pressure.

Surface Tension—Available data on the surface tension of molten metals and alloys are extremely scant, no doubt because of the lack of reliable methods of determination, particularly for the high-melting-point metals. There is a good correlation, however, between the surface tension of molten metals and their atomic volume[12] (Fig. 3), and this fact would suggest that the surface tension of pure iron fortunately is as high as approximately 1500 dyne per centimeter. The author obtained values[13] of 1550 dyne per centimeter from measurements on solidified sessile drops of pure iron that had been melted on plane silica surfaces under vacuum.

Several investigators have made quantitative determinations of the surface tension of iron-carbon alloys. Recently Kozakevich, Chatel, and Sage,[14] using the sessile-drop technique and measuring the dimensions of the drops by radiographic projection, obtained the equation $\sigma = 1600 - 100$ (per cent C) between 0.1 and 5.0 per cent carbon for the variation of the surface tension of molten iron with carbon content. Their results are similar to those of Popel, Esin, and Nikitin,[15] but substantially higher than those of Becker, Harders, and Kornfeld.[16]

Other elements besides carbon normally present in steel, such as silicon, manganese, phosphorus, and sulfur, all can be expected to decrease surface tension to a certain extent. Also, in line with other metals, surface tension probably decreases slightly with increasing temperature. It may be concluded, however, that under practical casting conditions, the surface tension of steel does not vary much.

In collaboration with Hoar,[6] the author was able to establish experimentally, for a wide range of metals, that the penetrating pressure and the surface tension of the penetrating metal are proportional (Fig. 4). This result gives considerable support to the theory that metal penetration is essentially a surface-tension phenomenon. It follows

from the results shown in Fig. 5 that the height of any particular molten metal necessary for the onset of penetration is proportional to the ratio of its surface tension to density. Since the surface tension of a molten metal is approximately inversely proportional to its atomic volume,[12] it can be seen that the height of molten metal that can be supported by a given sand without penetration is inversely proportional to the atomic weight or atomic number of the metal.

Contact Angle—The contact angle of molten metals with sand and with other refractories certainly is much greater than 90 degrees because of the high ratio of cohesion of metals to their adhesion for silica. Values of the order of 130-150 degrees[6] have been determined semiquantitatively for steel and quantitatively for such low-melting-point metals as tin.[17] Similarly high values may be expected for all metals unless chemical reactions occur between the metal and the sand, resulting in an increase in the energy of adhesion between them. Thus the presence of certain reactive elements in the steel may reduce the contact angle to a limited extent.

The drop in penetrating pressure with increasing carbon content of steel, as shown in Fig. 5, probably is due mainly to a reduction in the contact angle and, to a lesser extent, to reduction in the surface tension. It is well known that reduction of silica by carbon may occur at steel-casting temperatures, and such reactions could reduce the contact angle of steel with silica. Such reactions also must take place during the penetration of alloy steels.

It has been suggested frequently that the presence of iron oxides facilitates the spreading of steel on silica-sand surfaces and might eventually result in actual wetting. Figs. 6 and 7 show the sessile drops formed by heating drops of low-carbon steel in vacuum and in air, respectively, on a silica surface. Although, as expected, wetting of the silica surface by molten iron oxide occurred readily, it can be seen that no spreading of the steel has taken place on either the silica surface or on the iron-oxide-coated silica surface.

It will be apparent that surface tension and contact angle are two inherent properties of the molten steel or metal being cast over which little or no control can be exercised and that they vary only slightly during the casting operation. Consequently, the main efforts of the foundryman must be directed toward controlling and reducing the effective pore radius of the sand, within the limits consistent with good foundry practice.

Effective Pore Radius—The effective radius of the pores between sand grains varies widely in the foundry and depends on numerous factors, including fineness of the sand, its grading, binder content, degree of compaction, sintering temperature, the presence of fusible materials such as metallic oxides, and the presence of mold and core dressings of a wide variety. These factors are of the utmost importance in determining a sand's resistance to metal penetration and consequently form a substantial portion of this paper. The next installment will consider these factors.

(To Be Continued)

REFERENCES

1. R. C. Emmons and J. R. Bach, FOUNDRY, April, 1955, Vol. 83, p. 108, and R. C. Emmons, J. R. Bach, and J. B. Jones, FOUNDRY, October, 1956, Vol. 84, p. 150.
2. S. H. Ljunggren, *Jernkontorets Annaler*, 1945, Vol. 129, p. 457.
3. P. R. Beeley and H. T. Protheroe, *Journal*, Iron & Steel Institute, 1951, Vol. 167, p. 647.
4. J. B. Caine, *Transactions*, AFS, 1945, Vol. 51, p. 647.
5. R. E. Savage and H. F. Taylor, FOUNDRY, September, 1950, Vol. 78, p. 82, and H. F. Taylor and J. Navarro, FOUNDRY, December, 1957, Vol. 85, p. 76.
6. T. P. Hoar and D. V. Atterton, *Journal*, Iron & Steel Institute, 1950, Vol. 166, p. 1.
7. H. Petterson, *Transactions*, AFS, 1951, Vol. 59, p. 35.
8. J. B. Caine, FOUNDRY, July, 1947, Vol. 75, p. 72.
9. T. P. Hoar, D. V. Atterton, and D. H. Houseman, *Journal*, Iron & Steel Institute, 1953, Vol. 175, p. 19.
10. *Foundry Sand Handbook*, AFS, p. 121.
11. D. V. Atterton and D. H. Houseman, *Nature*, 1953, Vol. 171, p. 980.
12. D. V. Atterton and T. P. Hoar, *Nature*, 1951, Vol. 167, p. 602.
13. D. V. Atterton, unpublished work.
14. P. Kozakevich, S. Chatel, and M. Sage, *Comptes Rendus*, 1953, Vol. 236, p. 2064.
15. S. I. Popel, O. A. Esin, and Y. P. Nikitin, *Dokl. Akad. Nauk.*, USSR, 1952, Vol. 88, p. 253.
16. O. Becker, F. Harders, and H. Kornfeld, *Archiv. Eisenhuttenw*, 1949, Vol. 20, p. 363.
17. D. V. Atterton and T. P. Hoar, *Journal*, Institute of Metals, 1953, Vol. 1, p. 541.

Fig. 6—Sessile drop on a silica surface. Steel is Armco iron which was melted in a vacuum

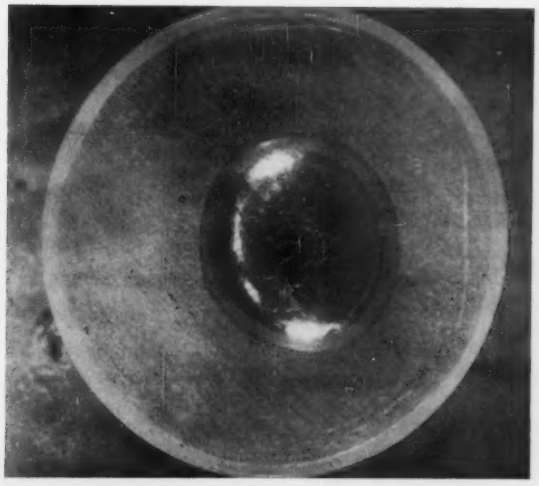
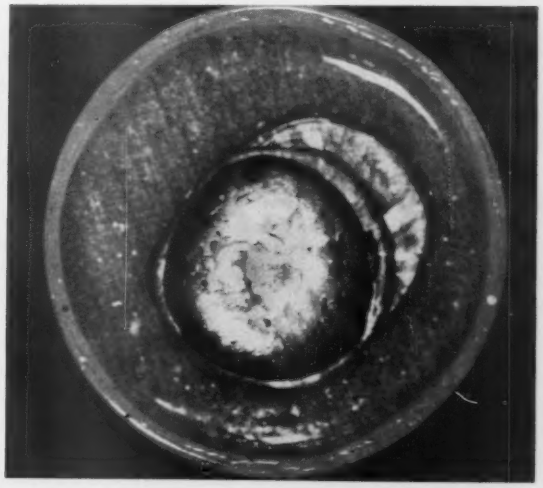


Fig. 7—Sessile drop on a silica surface. Steel is Armco iron melted with free access of air



SHRINKAGE IN

The second article in Mr. Frear's series on shrinkage in tin bronze deals with dissolved gases in melts, and particularly with hydrogen

BECAUSE of the tremendous deterrent effect which dissolved gases may have on the feeding of tin bronzes, it will be well to study all cases where such gas may become dissolved and then discuss methods of preventing gas pickup.

Normally, these gases are oxygen, hydrogen, water vapor, carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen, and certain hydrocarbons. It has been reported that the only gases which can actually dissolve in molten bronze are monatomic, which appears to rule out water vapor, carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen, and the hydrocarbons, also ordinary oxygen and hydrogen. It is possible, however, that these gases may be indirect causes of gas pickup. Oxygen can unite easily with most molten metals to form oxides which will be held suspended in the melt. In most cases, however, oxygen can be easily removed by the use of deoxidizers.

Ordinary hydrogen will probably not dissolve in molten bronze. When it is first set free from care of its compounds, however, there is an instant when it is in the atomic or nascent state, under which condition it will dissolve easily in almost any metal. If such nascent hydrogen is in actual contact with the molten metal bath, solution is almost certain to occur. Once hydrogen has dissolved in the molten metal, it is almost impossible to remove it completely by any foundry production means. This one gas can problably be blamed for the majority of shrinkage unsoundness in castings.

The writer has never found any actual proof that carbon monoxide will dissolve in molten bronze or will be decomposed by the melt. Carbon dioxide, one of the main ingredients of burned fuels, can decompose into carbon monoxide and oxygen, the latter being capable of combining with the melt. Here again, however, the oxygen can be easily removed and its solution, as described later, may be of advantage.

Sulfur dioxide, which is formed in the combustion of certain fuels high in sulfur, can be very harmful but can be eliminated or reduced to amounts which are not dangerous by using fuels very low in sulfur. This is the usual practice in well operated foundries, and the danger from this source should be easily avoided.

Hydrocarbons, which make up most of our gaseous and liquid fuels, are not dangerous in themselves but, in burning, form carbon dioxide and water vapor, and sometimes a small amount of carbon monoxide. Of these gases, the only thing which we have really to worry about is the water vapor, the effect of which will be discussed in detail later. The discussion to follow will concern itself with hydrogen and to a lesser extent oxygen.

It might be advantageous here to discuss briefly the relative and combined effects of hydrogen and oxygen in causing unsoundness in tin bronze castings. It should be borne in mind that all gases are slightly soluble in solid metal, the upper limit being known as the limit of solid solubility. This limit has previously been stated as 2 cc of hydrogen in 100 grams of copper. If the amount of hydrogen dissolved in the molten metal is less than this limit of solid solubility, there will be no evolution upon solidification. The difficulty is that this limit will vary, being greater if the pressure on the molten metal is increased and less if the external pressure is decreased. Quickly cooled metal will also hold slightly more hydrogen in solid solution.

We would expect more trouble with dissolved gas in vacuum pouring than we would in pressure pouring. The limit of solid solubility apparently is also lowered considerably if oxygen is present in the form of metallic oxides in the metal. This is indicated by the fact that shrinkage due to hydrogen evolution often is prevented entirely by a more thorough deoxidation of the melt. The dissolved hydrogen and the combined oxygen in a melt of metal can easily combine to form water vapor, which can cause large discolored cavities and also prevent feeding. Care should be taken, therefore, to deoxidize every melt completely.

As to nascent hydrogen, 1 gram (0.04 ounce) of hydrogen will, on being expelled from solution at the instant of solidification, have a volume greater than 3 cubic feet. This calculation assumes that the hydrogen is in the diatomic state. The volume would be doubled if it remained in the nascent condition.

The most important problem is to know the possible sources of such dissolved hydrogen and how to prevent their occurrence or to keep the amount of gas available for solution within such low limits that the total amount of dissolved gas will be less than the limit of solid solubility.

Sources of Hydrogen—The chief sources of hydrogen, all of which may be present during the melting of the metal, pouring, and through the solidifying process, are: 1. Hydrogen already present in the metal charged. 2. Foreign matter on the surface of the metal charged. 3. Combustion of liquid or gaseous fuels. 4. Combustion of solid fuels. 5. Humidity in the air. 6. Damp furnace linings. 7. Fluxes. 8. Charcoal covers. 9. Damp ladle linings.

TIN BRONZE

By CLYDE L. FREAR
Foundry Engineer
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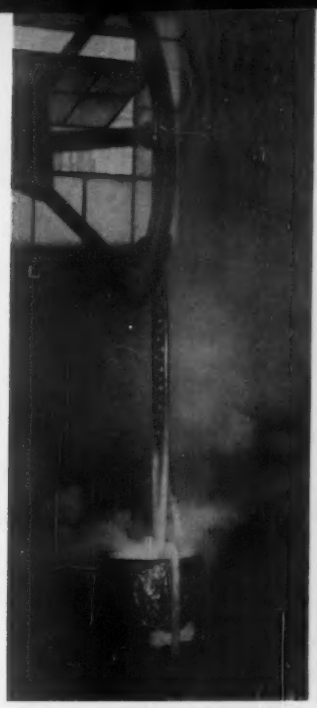

10. Wood skimmers. 11. Bags of organic materials in which ladle additions may be made. 12. Molds and cores. Each of these items will be considered in detail.

Almost anything we can do to metal in the foundry is a potential cause of gas and could, under certain conditions, contaminate the melt. The outlook should not be considered as being too discouraging, however, because some of the items mentioned would be possible gas sources only through extreme carelessness. On the other hand, some of the possibilities mentioned are very common and require care to prevent deterioration of the metal because of them.

It should be mentioned that prevention of hydrogen pickup is much easier and cheaper than getting rid of it once it has become dissolved in the metal. Some years ago Baer and Loring[4] did considerable research on eliminating dissolved hydrogen by flushing the melt in the furnace with dry nitrogen. Although the properties of gassed metal were improved by this flushing, they were never as good as those of metal melted in such a manner that no gassing occurred. Later, Johnson, Bishop, and Pellini[5] found that apparently all of the dissolved hydrogen could be removed by subjecting the melt to a high-vacuum treatment. Although this treatment appears to be capable of removing all dissolved hydrogen, the equipment is rather expensive and in the case of tilting furnaces would be difficult to apply. Ingot manufacturers subject the molten metal to a long oxidizing treatment, generally by blowing a current of air over the metal surface. This practice eliminates the hydrogen but is hardly practicable in the foundry.

Hydrogen Present in Metal Charged—Considerable metal used in the charge may contain hydrogen. This hydrogen may be in two forms—that being held in solid solution and which will probably remain in the dissolved state when the material has been remelted; and that which is held in the interstices and shrinkage cavities within the casting. This latter hydrogen, being in the diatomic state, is insoluble in molten metal as long as it remains in this state. Gaseous molecules containing two or more atoms will, however, tend to dissociate slightly under heat into single atoms which are soluble. It is known that melting a metal containing large amounts of free hydrogen can introduce considerable of this hydrogen into the molten metal.

Cathode copper plates are used by some foundries as a source of melting stock. Theoretically, this copper, having been deposited electrically under closely controlled conditions, is the purest form of copper which can be obtained. In the electrolysis, however, some nascent hydrogen is set free at the same pole as the copper. The solution pressure at the interface between the electrode and the electrolyte forces much of this nascent hydrogen into the metal, where it remains in solid solution.

The writer has never been able to melt cathode copper in any type foundry furnace, using normal foundry methods of degassing, without obtaining castings which showed evidence of considerable hydrogen having been thrown out of solution on solidification. Cathode copper is not a good melting material for the production of tin bronzes. If it is necessary to use copper, the foundry should use either electrical copper scrap or ingot copper, both of which have been treated to remove the dissolved hydrogen. The same can be said for nickel squares and slabs, which are merely nickel cathode material sheared to size. In foundry work, only nickel shot or ingot should be used.

Since gassed returns will tend to introduce hydrogen into subsequent melts, certain safety precautions should be followed to insure that the amount of dissolved hydrogen in any melt does not exceed the limit of solid solubility.

Theoretically, it is only necessary to melt in such a manner that no hydrogen becomes dissolved in the molten metal. Except under unusual circumstances, the monatomic hydrogen existing in any solid metal is that which is in solid solution. Hydrogen present in the shrinkage cavities and other interstices will be diatomic and as such is not soluble in the molten metal. This is not strictly the case, however, for if this diatomic hydrogen becomes trapped in liquid metal, it may undergo slight dissociation at the melting temperature. The nascent hydrogen resulting from this dissociation will then

dissolve. It is for this reason, and the fact that there are likely to be additional sources of nascent hydrogen, that certain safety measures must be employed.

One such safety measure is to add to the charge certain oxidizing materials. Copper oxide is one material which will provide a certain amount of oxidizing action. As the charge melts, the available oxygen from the copper oxide will unite slowly with the dissolved hydrogen to form water vapor. The steam particles thus formed are insoluble in the molten bronze and will pass off to the atmosphere through the melt, if sufficient time is permitted.

For complete removal of the hydrogen, an excess of oxide must be provided. When the melting is complete, the bath will contain considerable oxide, which must be removed by the use of deoxidizers, such as phosphor-copper, which should be well stirred in just before pouring. The regularly recommended additions of phosphor-copper, 2 or 3 ounces per 100 pounds of melt, may not be sufficient, yet the residual phosphorus content should be kept within specified limits. If an error is made, the writer would prefer a slight excess of phosphorus and would be inclined to be lenient in this direction if he were buying the castings himself. A little practice in the deoxidation process will indicate the exact condition of the metal in the ladle or crucible, where deoxidation is complete yet where no excess phosphorus remains.

A good practice—too late, however, to correct in a particular pour—is to add just enough deoxidizer to remove the scum on the stream of metal flowing into the mold. After a short experience the melter should be able to judge, by the surface appearance of the metal in the ladle, the instant that deoxidation is complete. In accomplishing such deoxidation, the writer prefers to use as large lumps of deoxidizer as possible. Such lumps have a slower action and suffer less burning and consequent loss at the surface of the metal. For this reason, he specifies the use of broken slabs of phosphor-copper rather than shot, which is certain to contain numerous fine particles which are lost insofar as deoxidation is concerned.

Another word of caution. Deoxidizers—and this includes zinc and tin added to make up for volatilization losses—should *never* be added with the original charge. Under oxidizing conditions as recommended above, deoxidizers in the original melt will be oxidized first, thus using up the oxygen which was added to remove the hydrogen. Such additions should be made when the charge is completely melted and has been heated to the pouring temperature. At this time the make-up metals should be added—the tin first and then the zinc. The zinc has considerable ability to deoxidize the metal, and for this reason allowance must be made for such deoxidation loss. The deoxidizer should be added and immediately stirred in completely just before the metal is poured into the mold.

A much more efficient oxidizing addition, developed in England, consists of manganese dioxide lumps placed in the bottom of the melting crucible. During melting, this material will cause a gentle evolution of oxygen, which will be extremely effective in removal of dissolved hydrogen, yet any unused material will remain in the bottom of the crucible and not interfere with pouring. The remaining manganese oxide will be removed with the slag which is scraped from the emptied crucible. Proprietary compounds, sold in the form of small compressed blocks, are composed of manganese dioxide and copper oxide and are ideal for this purpose.

Foreign Matter in the Charge—Much of the scrap used, especially chips and remelted spillage, is likely to contain organic compounds such as oil, grease, paint, wood chips, and sweepings. If they are stored outdoors they may be wet or even coated with snow and ice. These materials are all potential sources of hydrogen. The best insurance, of course, is be certain that the material is absolutely free from such foreign matter even though, by employing certain procedures, it should be possible to use them in the charge without contaminating the metal.

If such materials must be used without thorough

cleaning, they should be charged in the bottom of the crucible and heated so that they attain a red heat throughout before any melting occurs. This temperature will be sufficient to burn off all organic material, including any carbon residue, and to evaporate all water. After such heating, the other components of the charge may be added and melting may proceed in the usual way. Of course, this slow heating will take time and will increase the total time of melting and require more fuel. For this reason, they may run up the melting cost to a point where their use is not economical. It is usually safer and more economical to sell such materials to refiners and buy them back as ingot.

A rather common practice in many foundries is to use returns as coolers to reduce quickly the temperature of a melt which has been heated too hot. This is poor practice for several reasons. First, the metal should never be heated hotter than necessary to permit pouring at the prescribed temperature. Such superheating in itself may in-

troduce hydrogen into the melt. Second, overheating requires more fuel and is uneconomical. Furthermore, all returns are likely to be somewhat dirty, will probably have some molding sand adhering to them, and will have a certain amount of moisture condensed on the surface, even though such moisture may not be apparent. When such returns are submerged in the molten metal, an ideal condition exists for the surface matter to be decomposed to form nascent hydrogen, which has no place to go except into the metal.

A Common Fallacy—Another closely related matter is the recommendation that the ladle of molten metal be allowed to stand for a time before pouring to permit dissolved gases to be expelled. A little thought will show the fallacy of this suggestion. If we permit the molten metal to stand, cooling all the time, we must superheat it enough to permit this cooling. This excess heating not only requires expensive fuel and time, but is likely to increase the content of dissolved gas. In a fuel-fired furnace especially, as will be explained later, the opportunity to dissolve harmful gases increases rapidly with rise in temperature.

The real argument against this practice, however, is that it cannot accomplish the desired end. The gas which really causes the interdendritic shrinkage is that which is evolved at the instant that the metal solidifies. It should be apparent that we will not eliminate this gas regardless of the time the metal remains in the crucible unless it becomes entirely solid. Such metal would hardly be in suitable condition for pouring into molds.

Metal in the furnace should be heated no higher than necessary to pour at the required temperature and should be removed from the furnace immediately at that time

Actually the metal in the furnace should be heated no higher than necessary to pour at the required temperature, and should be removed from the furnace immediately when this temperature has been reached. Nothing but deoxidizer should be added after tapping, and pouring should be accomplished in the shortest time.

Combustion of Liquid or Gaseous Fuels—Probably the greatest opportunity for gassing a heat of bronze comes from melting in a furnace heated by burning gas or oil; by the same token, the prevention of such gassing is probably the most difficult.

Both hydrogen and oxygen are constituents of water vapor or steam, which is formed in copious amounts when any gaseous or liquid fuel is burned in air. Methane is a fairly common gaseous fuel and makes up a considerable part of natural gas and most manufactured gases. When this gas burns completely in air, the volume of steam formed is four times that of the propane which was burned. The chemist expresses the reaction by this equation: $CH_4 + 2\,O_2 = CO_2 + 2\,H_2O$.

In this equation, the number preceding the formula of the compounds themselves represents the comparative volumes as long as these compounds are gaseous. As another example, consider a liquid fuel expressed as a pure hydrocarbon oil having the chemical formula C_9H_{20}. It burns completely according to this equation: $C_9H_{20} + 14\,O_2 = 9\,CO_2 + 10\,H_2O$. Calculating this equation to actual weights, we find that 1 pound of the fuel burns to produce more than 1½ pounds of water vapor.

In the ordinary crucible furnace the products of combustion can come into actual contact with the metal in the crucible. In certain types of reverberatory furnaces these products are actually blown against the surface of the melt. Unless a special type of furnace is used where the products of combustion are not permitted to enter the crucible, or unless the crucible is tightly capped to prevent the entry of these gases, considerable water vapor or steam actually comes into contact with the metal charge.

As mentioned before, water vapor itself will not dissolve in the metal. But at the temperatures at which it is formed in the furnace the water (steam) does not remain completely as such. There is always a certain amount of dissociation of the water vapor to form small amounts of nascent oxygen and hydrogen which can react with or dissolve in the metal. The amount of such dissociation increases with increase of temperature. The physical chemist expresses this reaction by the equation $H_2O \rightleftarrows 2\,H + O$. The double arrow shows that an equilibrium exists between the amount of water vapor and the two dissociation products. the amount of hydrogen, oxygen, and undissociated water vapor will always be in definite proportions. Raising the temperature will displace the equilibrium toward the right, forming more hydrogen and oxygen and less water. Lowering the temperature will displace the equilibrium toward the left, reducing the amount of hydrogen and oxygen. The first rule for limiting hydrogen pickup is to keep the temperature as low as possible. With excess temperatures, more nascent hydrogen will be generated and will be available for solution in the molten metal.

The physical chemist uses another type of equation to express the above chemical equilibrium: Concentration of water vapor ÷ (Concentration of oxygen x Concentration of hydrogen) = Constant.

This equation expresses the way by which the amount of hydrogen available for absorption can be lessened considerably, although not completely eliminated. What the equation really tells us is that when we have a state of chemical equilibrium or reversible reaction, such as that indicated by the preceding equation above, we can drive this equilibrium to the left by increasing the concentrations of either of the right hand components. Of

course, we don't want to increase the hydrogen; it should be kept as low as possible. It is a very simple matter to increase the oxygen, however, by blowing more air through the burners, or, as it is commonly expressed, by melting under oxidizing conditions. An excess of oxygen in the products of combustion will displace the equilibrium toward the left; in other words, it will materially decrease the amount of dissociation of the water vapor and therefore make less hydrogen available to be absorbed.

Neutral Atmosphere Efficient—It should be realized, however, that blowing an excess of air through the burners will cut down on the amount of heat available for melting, since a certain amount of heat will be required to heat this oxygen plus five times as much nitrogen. The most efficient heating is obtained with a neutral atmosphere where just enough air is present to burn the fuel completely. For the sake of economy the excess of air should be small but positive. It should also be realized that is impossible to prevent some hydrogen being formed regardless of the amount of excess oxygen present. It is advisable, then, to resort to additional available means of preventing this hydrogen from dissolving in the metal.

In considering means of preventing this hydrogen absorption, it is only necessary to prevent the products of combustion from coming into actual contact with the metal, since actual physical contact is necessary for solution to occur. If we use the manganese dioxide mentioned previously and actually have oxygen bubbling through the melt, the oxygen issuing from the metal surface and mixing with the products of combustion will not only prevent hydrogen from contacting the metal but will also lower the concentration of hydrogen by helping to displace the dissociation equilibrium to the left.

If the metal bath is covered by an oxidizing flux such as black copper oxide, this flux will oxidize the hydrogen before it can contact the surface of the bath and thus prevent its solution in the metal.

Of course, any mechanical means which prevents the products of combustion from coming into contact with the metal will also eliminate the chance of hydrogen contamination during melting.

The necessity for keeping the flame mildly but positively oxidizing while melting bronzes calls to mind a practice which has been noted frequently and which can easily outweigh the care taken to produce gas-free metal. Liquid- or gas-fired melting furnaces usually are fitted with two valves, one controlling the fuel and the other the air. When a charge is melted in a tilting crucible furnace and several taps are made into small ladles, it is common practice, before tapping, to turn off the air and next the fuel, then when the tap is completed to turn on the fuel, and adjust the air. Such practice produces a very smoky reducing flame which is ideal for permitting gas to enter the metal.

Tilting fuel-fired furnaces should be fitted with automatic mixers, the mixture being preset, using an Orsat or other suitable gas analysis equipment to determine the exact oxidizing conditions desired. The melter should have but a single control valve for turning the mixture off and on. By such means the quality of the flame will not be affected.

Combustion of Solid Fuels—Numerous pit type crucible furnaces still use coal or coke as fuel. These fuels produce very little water vapor in burning and create less danger of hydrogen pickup, especially since the crucibles usually are covered during melting. It should be remembered, however, that these fuels do contain small amounts of hydrogen-producing compounds. Coal contains some hydrocarbons in the form of tar-producing materials. When these materials burn in air, water vapor can be formed which can dissociate exactly as is the case with gas and liquid fuels, except to a much lesser extent.

Coke is almost pure carbon and ash-forming constituents, with almost no hydrocarbons; theoretically it should burn without producing water vapor. In its production, however, the incandescent coke, as it comes from the ovens, is quenched with water and becomes thoroughly saturated. A large proportion of this water is retained and the content may be increased if it is stored outdoors. When the coke is charged into the furnace, this water evaporates and could gas the metal, especially if a piece of the coke were permitted to fall into the pot of molten metal. Here again the fact that the crucibles usually are covered should safeguard the heat but the possible danger should be kept in mind.

(To be concluded next month)

REFERENCES
4. Baer and Loring, *Transactions*, AFS, Vol. 57, 1949, Page 257.
5. Bishop, Pellini, and Layne, FOUNDRY, December, 1954.

Coal and coke produce little water vapor in burning and minimize hydrogen pickup

In this article, the author discusses linings, coke, chill tests, fluxes, tuyeres, desulfurization, and other factors which are of great importance to . . . .

Efficient Cupola Operation

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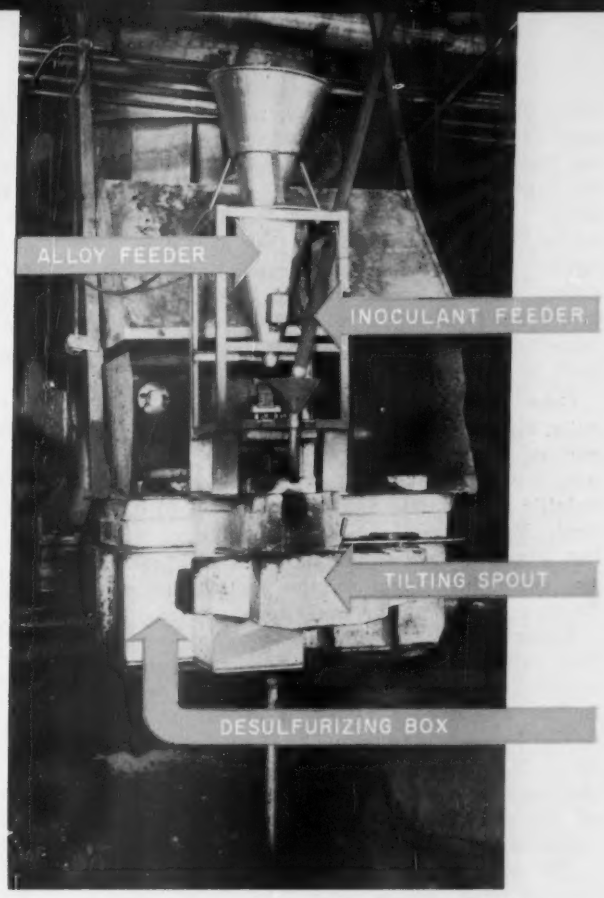


Today, we have effective means of desulfurizing iron to very low levels. The setup shown here is in use at the Worthington Corp. foundry

EFFICIENT operation of the cupola is related basically to several interdependent conditions. Let us begin our discussion with the lining and its maintenance.

Types of Linings—There are three general types of linings—straight, boshed, and the so-called contour. The straight type is, of course, that in which lining is maintained at a uniform diameter from bottom to top of the cupola. In the bosh type, the diameter of the lining immediately above the tuyeres is reduced to a dimension less than that of the area above the melting zone.

Contour lining follows the shape of the melting zone or burn back, which is generated after the first heat has been melted in a newly lined cupola. Location and shape depend on length of the heat, temperature of melting zone, air blast, fluxing materials, amount of steel scrap, etc. The chief argument against the contour patch is that it deposits less refractory, and the lining may become so thin on high-tonnage melts that the shell can be injured.

Thoroughness is of extreme importance in patching, regardless of the outline of the patch or lining. The operation often is regarded merely as "filling up" a cavity in the lining, without recognition of the need to patch for the highest obtainable degree of permanency. The material used should possess the highest combination of refractoriness and bond, and a ledge should be provided which protrudes beyond the tops of the tuyeres several inches toward the vertical centerline of the cupola. Preferably, gun placement of the material is employed to patch cupolas over 36 in. in diam.

The subsequent treatment is to tamp the deposit either by hand or with an air rammer, omitting the formation of "feather edging" at the top of the patch. Tamping insures greater, more uniform density in the entire placement, and the lining will last longer.

The patch is dried with suitable burners, usually gas-fired and generally homemade. The entire patched zone should be dried thoroughly and uniformly. The dryout may be applied advantageously to all linings. This treatment involves little expenditure and pays off in better quality iron and fewer scrapped castings because it helps to maintain proper bed height.

Dimensions of the lining should be kept constant to avoid daily variations in the bed height. Such variations generally are accompanied by inconsistencies in the chemistry and quality of the

iron. To accomplish this end, templates are employed to gage the contour, and telescopic measuring rods are used for the diameters just above the tuyeres and in the melting and superheating zones. Dimensions in these localities vary, of course, with cupola size, but they should be held rigidly for each individual cupola. The lining should start to recede several inches above the tuyere shelf, continue to do so gradually to the centerline of the superheating zone, then come back to the full diameter of the stack.

Coke—Our next consideration is coke. Chemically, high-grade coke has this composition: Fixed carbon, 90-93 per cent (90 per cent minimum); ash, 6-9 per cent; sulfur, 0.5-0.7 per cent; and volatile combustible matter around 0.8 to 0.9 per cent. Volatile matter is of no significance in melting. Fixed carbon is the index of fuel value, or the useful heat input for the melting and superheating phases of the operation.

Unfortunately, the effectiveness of coke of high fuel value can be offset by poor structure, high reactivity, and small size. The term reactivity is the measure of reduction of carbon dioxide (CO_2) by carbon according to the equation $CO_2 + C = 2CO$. This property is of the utmost importance as a measure of the usable heating value of the coke and as an indication of the actual operating conditions in the cupola.

Cell structure of coke is directly related to combustion rates. Dense cell structure is the most desirable because it has more stability during combustion. Generally, coke size is related somewhat to the diameter of the cupola lining. Low ash content is important. Sulfur in coke should be as low as possible because the amount of sulfur in iron varies with that in the coke.

The Coke Bed—Preparation, height and burning-in of the coke bed are among the most critical items in the successful operation of the cupola. They should be carried out with utmost care and precision.

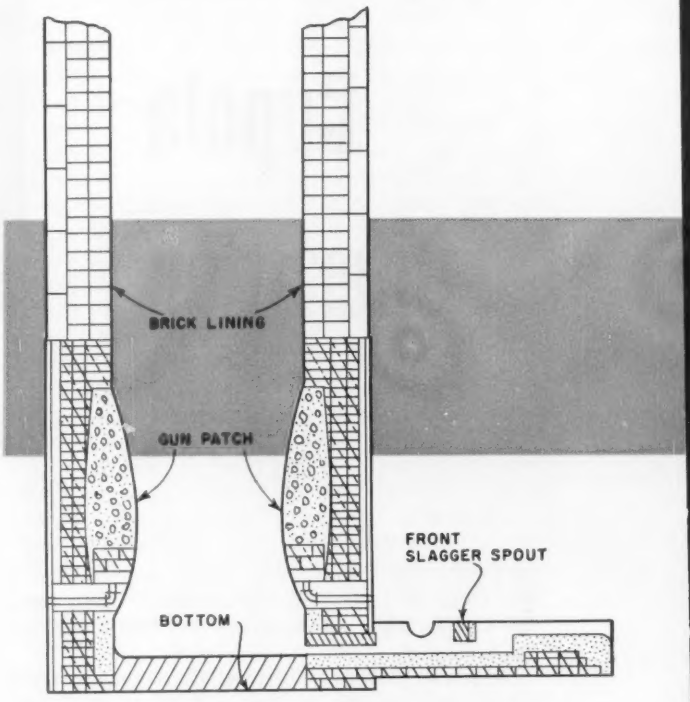
Lack of attention to these factors is uneconomical. Cold iron results, causing the expense of misrun castings and the efforts required to restore ideal conditions. A general rule for coke size is that it be approximately 8½ per cent of the diameter of the cupola in the melting zone. For example, a 72-in.-diam lining would be about 66 in. at the zone. Coke 8½ per cent that diameter would be approximately a 4 x 6-in. size.

The method of lightoff is a matter of preference. We use kindling wood, for two principal reasons: 1. We employ the front-slagging operation and put in the breast and taphole the day prior to the operation of the cupola. We have two cupolas in our Buffalo plant and operate them alternately. 2. The front-slagging procedure requires a thoroughly dried taphole to prevent enlargement during the heat which would cause trouble at the dam and skimmer in the spout.

Other methods of kindling include torches, gas, electric igniters, and externally ignited coke. Burning-in may be by natural draft or by air forced from the blower or the compressed air lines. Generally a combination is used. Natural draft is used first, followed by air from the blower, judiciously applied.

Bed Height—To establish the proper bed height above the tuyeres for a cupola of a given size, some experimentation is necessary. As a guide, a formula may be used—namely, 10.5 times the square root of the windbox pressure, plus approximately 20 per cent. For example, if the operating pressure is 16 oz, we find that $10.5\sqrt{16} = 42$ in. + 20 per cent = 50 in.—the bed height above the top of the tuyeres. Bed height should be measured carefully before charging is started and should be adjusted as experience dictates.

A check to determine the optimum height is to time the first flow of iron from the taphole. It



should occur in 8 to 10 minutes. If a longer interval is required, the bed is too high. A shorter period indicates that the bed is too low. Depending on the conditions, adjustments of the air and coke charges may be made to correct the condition for the particular run. On the second or third day, the optimum will be obtained and it should be maintained.

Let us consider now the volume or weight relationships of air to coke for maximum melting temperature. One pound of air at 70° F has a volume of 13.3 cu ft. For a 72-in.-diam cupola, between 7800 and 8000 cfm and a 6 iron to 1 coke ratio generally are required for good melting practice. The weight equivalent of this amount is 8000/13.3, or 601 lb air. The amount of air supplied to a cupola is of no less importance to good melting practice than proper selection and proportioning of fuel, flux, and metal charges. An in-

sufficient charge means slow melting and, generally, cold iron. Excess air with the same coke-to-iron ratio causes hot iron and an accelerated melting rate.

If the weight of coke is not adjusted accordingly, or the air charge reduced, however, the temperature of the iron eventually will drop too much. This drop may result in a higher percentage of defective castings because of misruns.

Tuyere Design—There are many designs and sizes of tuyeres for uniform distribution of air to the cupola. Some are water-cooled for heats of long duration, and others employ two or more rows of tuyeres. Shape and size of the tuyeres should be selected to insure uniform distribution and adequate penetration of the volume of air necessary for efficient combustion of coke.

The most exact calculations often are upset by the obstruction of the coke which occupies the space directly in front of the tuyeres. When the tuyere area is too small, the velocity may be high, but be accompanied by excessive cooling of the iron, and the amount of power required to operate the blower will increase. Small tuyeres have a tendency to increase bridging between the tuyere areas. On the other hand, if the tuyeres are too large, velocity will be decreased and the penetration less. This condition often forms a cone of unconsumed coke in the center of the cupola.

Efficient operation of a cupola is related basically to several interdependent conditions. This drawing shows the essential details of construction of a front-slagging unit

Location of the tuyere gates with respect to the sand bottom and slaghole depends on the size and nature of the castings made in a particular shop. They should not be placed too high above the sand bottom if coke consumption is to be kept low and the iron hot, as in the production of light work. When the cupola is tapped intermittently, however, or where a forehearth or receiving ladle is not employed, the tuyeres should be placed well above the slaghole to prevent the air from impinging on the molten iron. Also, the tuyeres in front-slaggers should be relatively low.

For a 72-in. lining, the average height is 9 in. above the highest point of the sand bottom. At the taphole it is approximately 10½ in. to the tuyeres. In general, the tuyeres are rectangular, with the long axis from two and a half to three times the short axis. Some are box-shaped, and others flare inward.

The ratio of total area of the tuyeres to the area of the cupola varies considerably. So does the velocity of the air entering the cupola. The anemometer has been applied to check this. It has revealed that some tuyeres provide high velocity and others low velocity. Adjustments may be made by inserting one or more fillers ranging from ¼ to ⅜ in. thick (usually steel plates) into those of low velocity and again checking with the anemometer. If all check within from 1 to 2 per cent of each other, the result is satisfactory. If not, further adjustment and checking are necessary. By balancing the air input, we obtain more uniform burnout and greater uniformity in the chemistry of the iron because of better combustion of the coke. Hotter iron also is likely.

Cupola Fluxes—The fluxes commonly used are pure limestone or dolomite which contains the carbonates of both calcium and magnesium. With either, a relatively small amount of a packaged flux containing a fluorspar may be used advantageously. Fluorspar makes the slag more fluid and wets the coke, so to speak, thereby permitting more efficient combustion of the fuel. It also acts as a mild desulfurizer.

A good combination is approximately 20 per cent of the weight of coke as limestone or dolomite and 0.15-0.20 per cent as spar flux. The slag in cupolas employing front slagging must be somewhat more fluid than slag in rear-slagging cupolas. Continuous tap characterizes the front and rear siphon systems. Intermittent tapping ordinarily involves slagging off through a hole in the rear of the cupola, several inches below the level of the lowest part of the tuyeres. The front and rear siphon systems are the cleanest, and water-flushed pipes may be set up to catch and dispose of the slag discharged.

Several tests have been set up to check melting conditions during cupola operation. The slag test consists of collecting a sample in a receptacle and pouring it slowly onto a clean plate so as to form stringers. When held to the light, these stringers should appear clear. This result indicates that melting is proceeding without oxidation of iron. A dark green or black color indicates that the iron is being oxidized. The test should be repeated after a short interval. If the slag again appears dark, the coke bed is low, and a coke split should be added.

Further verification should be made by checking the smoke emission from the stack. A dark brown color indicates that the bed is becoming too low and that more coke is required. White smoke indicates a high bed, and the coke charge may be reduced as experience dictates. A light buff color indicates ideal melting conditions.

These tests are, of course, supplementary to chill tests, which are made in our shop on every ladle. We use wedges ½ x 1 x 5 in. for 30,000-psi iron and ¾ x 1¾ x 5 in. for 45,000-psi iron. The extent of the chill is measured across the legs of the isosceles triangles at the locale terminating the carbide formation and at the beginning of the gray in the fractured specimens.

Should the line of demarcation be indistinct, the measurement is taken a bit high up in the mottled area. Fixed values are placed for chill width and minimum casting thickness. Generally, two chill

tests are made, one as the iron leaves the spout. On this chill measurement, the amount of inoculating agent is calculated. For example, if the chill desired is ¼ in. and the first wedge shows 7/16 in., the amount of inoculating agent should be 2 lb per ton. Should the chill be ½ in., the amount would be increased proportionately. Should the chill be low, the amount of agent should be reduced somewhat. A second test is made after the agent has been added to the ladle, and the chill is recorded.

These relations apply to 45,000-psi minimum tensile irons. For lower-strength irons, the desired chill is from 1/32 to 3/32 in., but the extent of the base inoculating agent additions practically remains the same. These agents (generally alloys of silicon and manganese) perform two important functions. One is to reduce chill effect and the other to increase the tensile strength of the iron.

Inoculation—Inoculating action is, however, not permanent; generally, the graphite flakes tend to revert to their original size ten minutes after the treatment. For this reason the inoculant is not added until about half of the required amount of iron is in the ladle. Pouring should be done as soon as possible.

The most effective size of the inoculant is ⅛ x ¼ in., and fines should be eliminated. In our foundry, the agent is added to the iron by a feeder that delivers it uniformly to the iron. Our procedure is as follows:

Desulfurized iron from the desulfurizing unit flows down a spout and discharges into the well of a tipping spout and thence into the ladle. Inoculant from the feeder falls into a funnel at the end of the spout and into the stream of iron flowing into the well of the tilting spout. This assembly provides uniform inoculation.

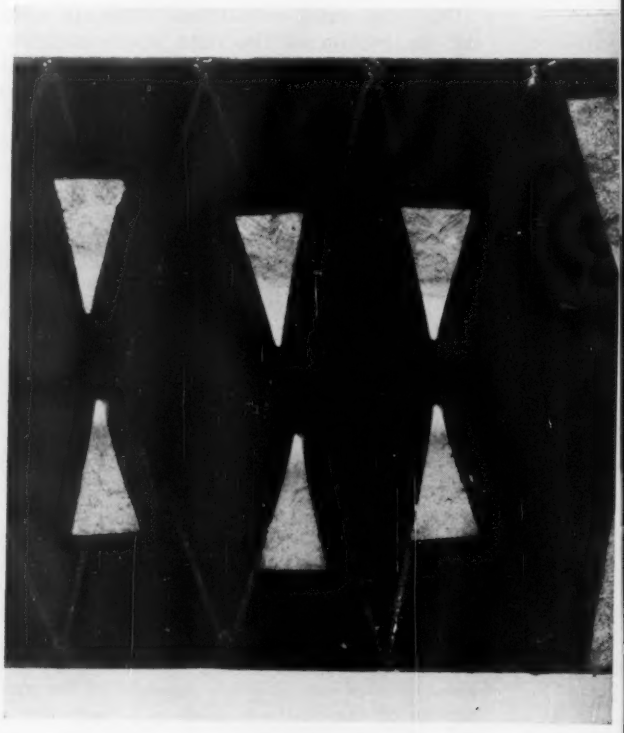
Factors Affecting Chill Values—The chill test is an added method of controlling the quality of gray cast iron. Its use does not mean that it is possible to get by with poorer charging practice or low-grade melting stock. It does provide an efficient means of obtaining more uniform results in the castings.

Often some of the factors which affect chill values are overlooked or neglected—a situation which can lead to erroneous conclusions. These factors are the following: 1. Precision in performing the chill test procedure. 2. The chemical compositon of the iron. 3. Melting conditions. 4. Inoculating agents added to ladle or spout.

In regard to the first point, chill tests should be performed uniformly for each ladle. The sampling ladle should be hot and clean. It should be cleaned each time before sampling by being filled with iron running from the spout, and it should be emptied and refilled several times. This procedure will heat and clean the ladle. When wedge-shaped core molds are used, they should be clean and of uniform temperature.

Point two is important because the composition of the iron affects the chill in several ways. Extraneous metals such as tellurium or antimony greatly increase the chill and thereby mask the effects of carbon and silicon, which are of primary interest. High sulfur and chromium over 0.30 per cent in iron of the 3.4 carbon equivalent range are reflected in higher chill.

The selection of proper melting stock and its proper proportioning in cupola charges minimize these effects and keep the elements mentioned within reasonable tolerances. The test then will reflect the desired silicon and carbon relations, commonly expressed as the carbon equivalent, or the percentage of total carbon plus one-third the silicon. With good charging and melting practice, coupled with control of the chemical composition, chill test values depend on melting conditions within the cupola.



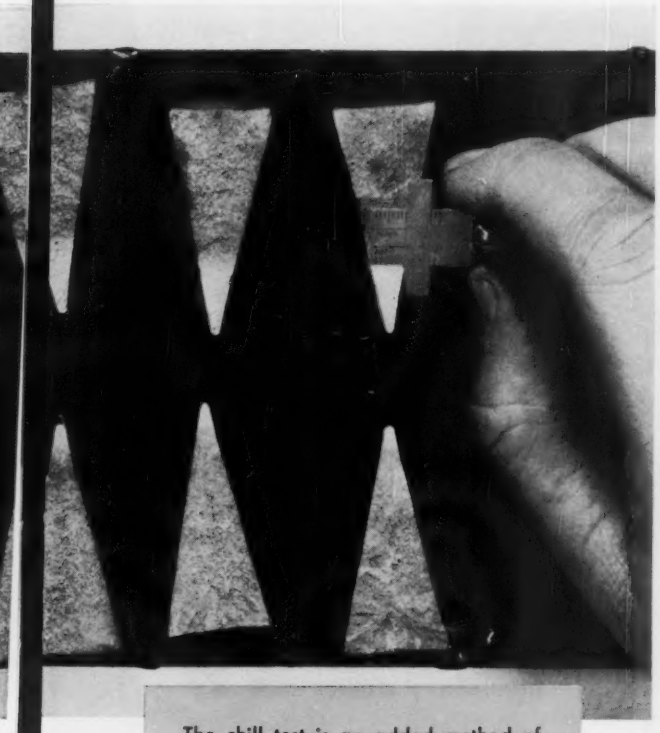
A low-bed, high-iron-oxide slag from an excessive amount of rust on the scrap, a low bed and high blast, or other oxidizing conditions result in an abnormally high chill. A soft blast and a rich coke ratio coupled with a deep well tend to cause a lower than normal chill value.

Iron melted under oxidizing conditions shows, in addition to a high chill, a coarse mottle between the chilled and gray areas. Undercooling also causes this pattern. A chill test showing coarse structures in the mottled zone or a sooty appearance in the gray zone is greatly improved by inoculation.

Desulfurization—The presence of sulfur in most grades of cast iron serves no good purpose and is

considered simply a necessary evil in iron production. The chief source of sulfur is the coke. In general, the higher the sulfur content of the coke, the more sulfur in the iron.

For example, a charge consisting of 600 lb foundry return with 0.08 per cent S, 200 lb of pig with 0.025 per cent S, and 1200 lb of steel scrap with 0.03 per cent S will contain 0.89 lb, or 0.0445 per cent sulfur in the 2000-lb composite. When such a charge, with 0.5 per cent S in the coke, is melted, iron at the spout contains close to 0.13 per cent sulfur, or 2.6 lb per ton, a pickup of 1.75 lb per ton, or 100 per cent.



The chill test is an added method of controlling quality of gray iron. It provides an efficient means of obtaining more nearly uniform castings

With higher sulfur in the coke, the increment is proportionally higher. The chief effect of high sulfur is decreased machinability, caused by sulfur holding more carbon in the combined form. In extremely thin sections, free cementite in corners and edges of castings takes the cutting edge off any tool in short order.

Other effects are increased brittleness, susceptibility to hot tears, and decreased fluidity. Under some melting conditions, when the bed tends to be low and efficient combustion is hampered by bridging, a defect occurs which is characterized by a depression in one or two places on the surface of castings from which globules of iron have been extruded. Chemical analysis of these areas shows high concentrations of sulfur and manganese—about 0.5 and 1.50 per cent, or even higher, respectively. Chemical analysis of samplings taken along the contours of the depression have shown 0.08 to 0.09 per cent sulfur and 0.70 to 0.75 per cent manganese. Indications are that such segregations are created by improper melting conditions.

There is no need to tolerate these evils, for today we have effective means of desulfurizing iron to very low levels, even to 0.015 to 0.02 per cent when necessary as prior to the nodularization treatment when nodular iron is made. When sulfur is reduced to around 0.04 per cent, iron shows increased tensile strength without a relative increase in hardness, and the microstructure shows many fewer nonmetallic inclusions or sonims.

Several methods are in use today for the removal of sulfur in iron. The more common include the addition of soda ash and/or caustic soda to the desulfurizing box, forehearth, etc., and the injection of calcium carbide into ladle or forehearth. Carbide also may be added to the coke charge in the basic cupola and to some extent in the acid cupola. We employ dense soda ash, or sodium carbonate, from which all fines have been removed. It is fed by gravity into the stream of iron at the end of our front-slagging spout.

The iron carrying the soda ash flows into a reservoir box just in front of the spout, where the removal of sulfur occurs. The purified iron discharges from the bottom of the box into a spout similar to that on a teapot ladle and from there into the tipper spout and ladle. The iron is free of slag and exceptionally clean. The spent ash slag is discharged into a trough leading to a water pipe and is carried to a sump outdoors, along with the slag from the dam.

The ash is fed at the rate of 5 lb per ton, and 50 per cent of the sulfur is removed—sulfur content is reduced from 0.14 to 0.07 per cent. Further reduction is possible by the use of soda ash briquets in the ladle. We have found that 25 lb per ton reduces sulfur from 0.07 per cent to 0.015 to 0.020 per cent. Factors which influence desulfurization include contact time between the desulfurizer and the iron, the amount of sulfur in the iron at the cupola spout before treatment, rate of melting, coke ratio, amount of desulfurizer used per ton of molten iron, and cleanliness of cupola slag from the molten iron before treatment. The latter will cause sulfur reversion.

The cupola is an efficient melting unit and when operated properly will produce iron of the desired high quality, uniformity, and temperature in the minimum time. The features described in this article are exercised daily by Worthington in its quality control program, which is aimed at producing highly refined base and alloyed cast irons of uniform structural and mechanical properties for the large variety of castings required for its many products.

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Controlling The CO_2 Process

Difficulties of introducing the CO_2 process into your foundry may be lessened by preliminary studies such as test methods described here

Fig. 1—Vane core used in casting blower casing tended to sag

THE difficulties of introducing the CO_2 process into your foundry may be lessened considerably by some preliminary investigation of the process.

Shortly after the CO_2 process was first used in the Joy Mfg. Co. foundry, the results indicated that the process would have only limited applications. Several major difficulties were experienced which discouraged wider use of the process. Even more important, it appeared that there were some hidden variables which could not be pinpointed, much less controlled.

At certain times everything appeared to work perfectly, but there were other periods when a great many things went wrong for no apparent reason. These troubles ranged from sticking in the corebox to a condition where the sand mixture would not harden. To discover more about the process in terms of our own applications, a development program was initiated.

Fans for electronic, aircraft, Navy, and industrial equipment are one of the principal products of our New Philadelphia, Ohio, plant. Castings for these fans are produced in an aluminum and magnesium foundry employing fewer than fifty men and, because of the plant's relatively small size and limited funds available, any development program had to be moderate in scope. It was concluded, however, that time could be allotted to investigate the process.

An important reason for our special interest in the CO_2 process was that a few vane cores necessary to the casting of blower casings were plagued by sagging difficulties. Fig. 1 shows a core of this type. Also, it seemed that the reputed reduction of gases in CO_2 cores would be of real benefit on several jobs, and there was the possibility of using a sand of higher grain fineness to improve casting finish. Finally, a real need was indicated for improving cast dimension tolerances.

Among the many variables that could be investigated, it was decided that these were most important: 1. Types of sand. 2. Proprietary sodium silicate binders. 3. Sand mixtures. 4. Gassing time.

Later it became evident that the methods of mixing CO_2 sand, variables in carbon dioxide gas, and parting agents would have to be investigated.

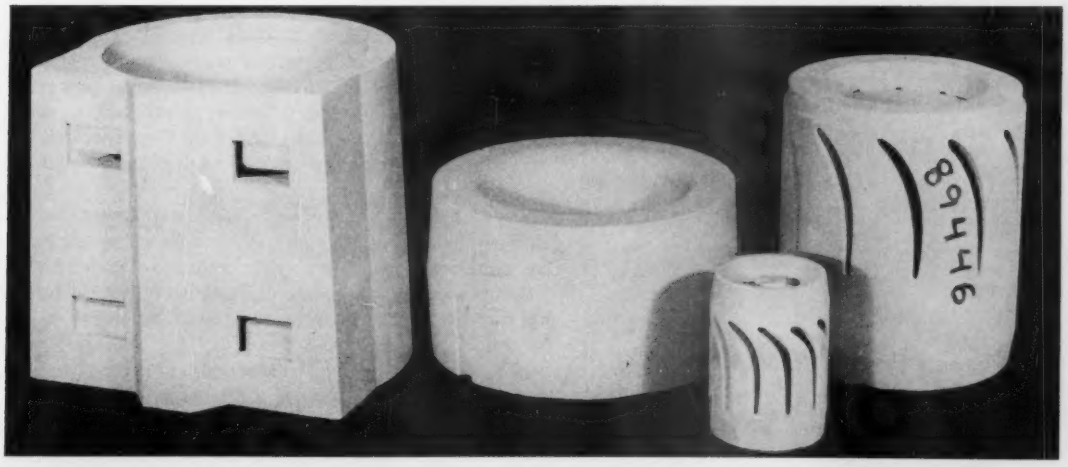
Some preliminary information had already been obtained up to this point. For instance, several of the proprietary CO_2 binders had been used and one of the binders was the overwhelming choice of the workmen using the process. For this reason, it was felt that no extensive testing needed to be performed in evaluating binders. Also, enough information had been obtained concerning sand limitations to know that the present sand being used could not be properly adapted to CO_2 work.

Sand Selection—It was decided that a sand of nearly 100 AFS grain fineness was necessary to obtain the type of cast surface desired and, further, that this sand should be capable of producing a core of sufficient edge hardness to withstand handling without serious abrasion.

Six sands of different types were used as the base for sand mixtures, using 4½ per cent sodium silicate binder. Cores of the type shown in Fig. 2 were made up of each of these sands and the results noted. Edge hardness and scratch hardness immediately after making and after several days' storage were the principal properties measured; however, observations regarding workability, knockout properties, etc., also were made. After several very simple tests, using a fixed percentage of sodium silicate binder and controlling the method and time of mixing, the evidence indicated that a sand of the following properties gave satisfactory results: Grain fineness (AFS) 85, 270 screen and pan 3.4 per cent.

It should be noted that at least three of the six sands tested gave good results, and that the performance of all three of those found unsatisfactory could have been predicted by applying the current known facts concerning limitations on

Fig. 2—These are the types of cores used in investigation of the variables present when applying the carbon dioxide process



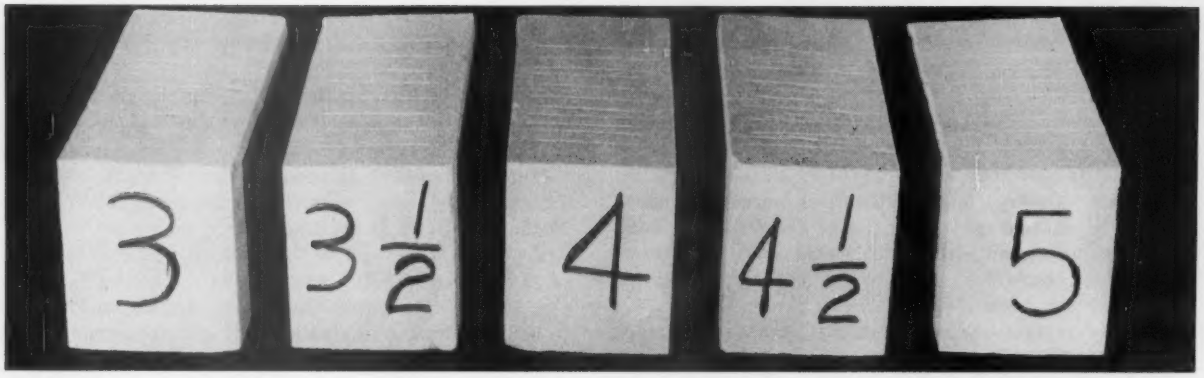


Fig. 3—Test cores containing various percentages of binder were tested for scratch and edge hardness as well as shelf life

grain distribution, moisture, and clay content.

Sand Mixtures—The common core sand additives —wood flour, cereal, kerosene, etc.—were all investigated under actual production conditions. No exact means of measuring workability, knockout ability, and tendency to stick were employed. Sufficient tests were made by a number of different coremakers and knockout men, however, to get a consensus or an expressed choice. About the only additives that were favored were small amounts (⅓ per cent) of wood flour and minute (1/6 per cent) amounts of kerosene.

To determine the optimum binder addition, sand mixtures of various binder percentages were made up into test cores (Fig. 3) and subjected to scratch and edge hardness tests. Also, shelf life observations were made over periods of up to two weeks.

Conclusions were that the properties of carbon dioxide sand mixtures were not appreciably enhanced by additives and that mixtures consisting of sand plus 4¼ per cent sodium silicate binder gave satisfactory results.

Gassing Procedure—The amount of gas required to harden CO_2 cores had not been, up to this point, measured in our foundry, and the possibility of a considerable amount of overgassing was indicated. As is known, the effects of overgassing, besides being costly, are injurious to the quality of the core or mold produced. To determine the amount of gas needed to harden a core of given weight properly, a series of experiments was conducted.

TABLE I—Scratch Hardness of Cores at Different Intervals after Initial Gassing

		3 Min.	2nd Day	3rd Day	6th Day	7th Day	9th Day	13th Day
1-lb Core	Gassing Period							
	3 sec.	70	75	78	75	75	80	80
	6 sec.	62	70	70	60	70	70	75
	9 sec.	72	67	75	70	73	78	78
5-lb Core								
	6 sec.	75	73	75	72	80	80	80
	10 sec.	78	70	75	70	73	78	78
	12 sec.	73	73	70	70	78	78	78
10-lb Core								
	6 sec.	60	80	80	75	70	82	82
	10 sec.	73	73	75	65	65	77	82
	12 sec.	65	73	78	70	70	78	82
25-lb Core								
	18 sec.	63	78	63	63	70	70	82
	24 sec.	70	72	70	65	65	75	75

CO_2 at 20 psi. Hardness tester—Harry W. Dietert Co. No. 673.

The test cores shown in Fig. 4 and production cores shown in Fig. 2 were made up to produce cores of various weights, and each core was exposed to carbon dioxide gas for measured times. Scratch hardness tests were made immediately and after given periods to determine the time required to harden sufficiently a given weight of sand. Table I shows part of the data obtained, and Fig. 5 shows graphically the necessary time of exposure to 20 psi of carbon dioxide for simple cores of up to 70 lb. Necessarily, the more complex cores, which do not provide a straight-line flow path for gas, require a longer time of exposure; the results of these tests, however, provide a good standard from which gassing times for more complicated cases can be derived.

Other Variables—As work progressed, there was an awareness of variables that could be introduced by using different types of mullers in preparing the sand mixtures; of some differences in the results obtained when two different bottles of carbon dioxide gas were used; and that a good parting agent for this process was needed to prevent periodic sticking problems.

It was impossible to determine why two different types of mullers would give markedly different results. Both seemed to provide adequate mixing yet there appeared to be in one case an incomplete coating of sand grains with the binder. Consequently, the cores would tend to stick to the box during stripping and to have poor shelf properties. The conventional wheel type muller gave best results.

Why different results were obtained from two different bottles of CO_2 gas is likewise a mystery. One suggested cause was that excessive moisture in the gas caused the same difficulties as would be experienced if there were excessive moisture in the sand.

Of the many parting materials suggested and tried, an aluminum powder such as is obtainable in any paint store gave the best results. The corebox in question should be rubbed liberally with

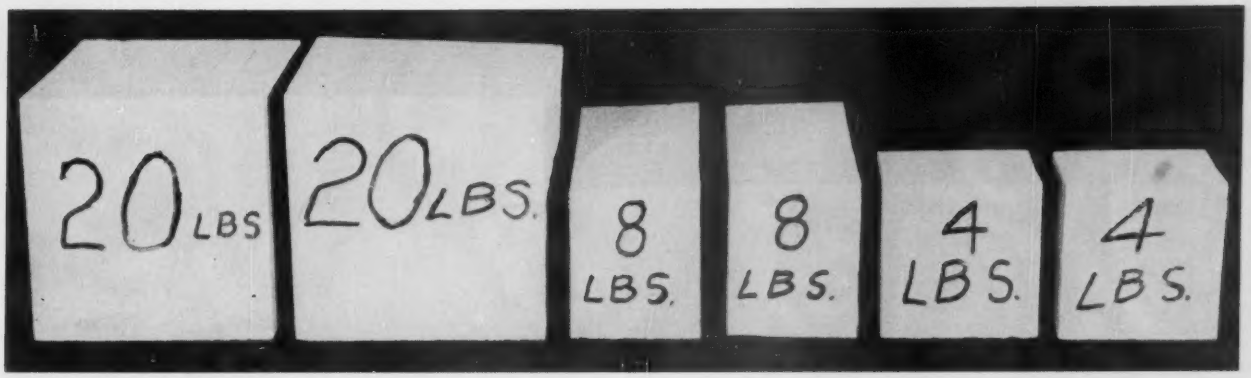


Fig. 4—These test cores were used to determine the time required to harden sufficiently a given weight of sand

this powder until a smooth, almost slick, finish is obtained. Results with this material have been excellent.

Applications and Results—The most striking advantage of the carbon dioxide process is evident in those jobs which could be made only with great difficulty because of the sag problem. In this type of core and in all other cores where green sand distortion causes major problems, the CO_2 process is of real value.

Also noteworthy is the improvement of cast tolerances that can be effected through the process. By close attention to the handling of the core prior to stripping from the corebox, it is possible to hold tolerances not attainable in conventional core-making processes.

Along with both of the above benefits, it has been possible for us to improve to a marked degree the appearance of our internally cored sections. Undoubtedly most of this improvement is related to the finer sand being used with the process; however, we have noted a small difference between conventional cores and CO_2 cores using the same base sand.

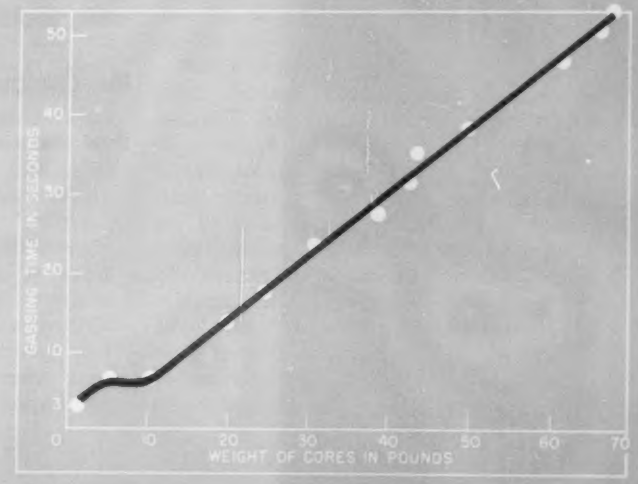
One claim of the CO_2 process which we have been unable to substantiate deals with gas evolution, or at least with the frequency of blows. Certain castings with which we have difficulty in venting are as likely, or perhaps more likely, to blow with CO_2 cores as with conventional cores. Certain of our observations on this subject do not appear to be factual enough to record, but we have found that a baking operation for 10 minutes minimizes the blowing occurrences.

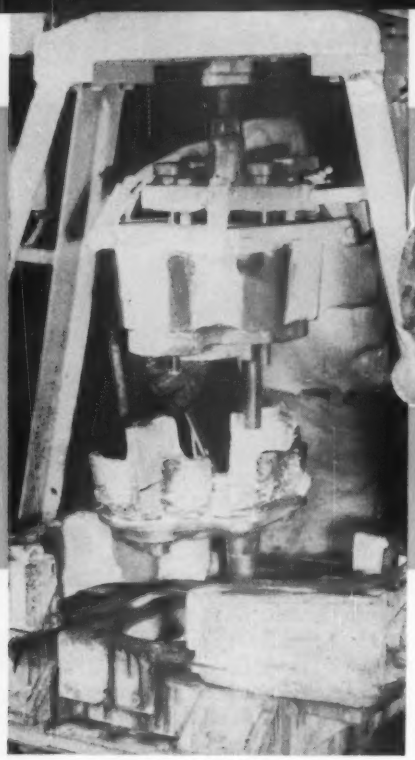
Cost Analysis—A cost comparison of labor and material between the CO_2 sand mixture and the oil sand showed a reduction of 14 per cent in favor of the former. This savings was due entirely to the reduction in the labor cost of mixing the sand and not in the cost of the raw materials, which are slightly higher for the CO_2 sand.

In addition to the savings in sand mixture, the elimination of the need for baking cores reduced in-process time by three hours and eliminated the handling of the cores in and out of the oven. This resulted in an average labor savings of 2½ cents per core.

At present, due to our inefficient methods of gassing, the carbon dioxide gas is costing approximately 50 per cent more per core on the average than the cost of operating and maintaining the core oven. However, with improvements in gassing equipment and methods, it is felt that this loss can be reduced if not entirely eliminated.

Fig. 5—Showing variation in gassing time at 20 psi for simple cores weighing up to 70 lb. Complex cores would require longer exposure time





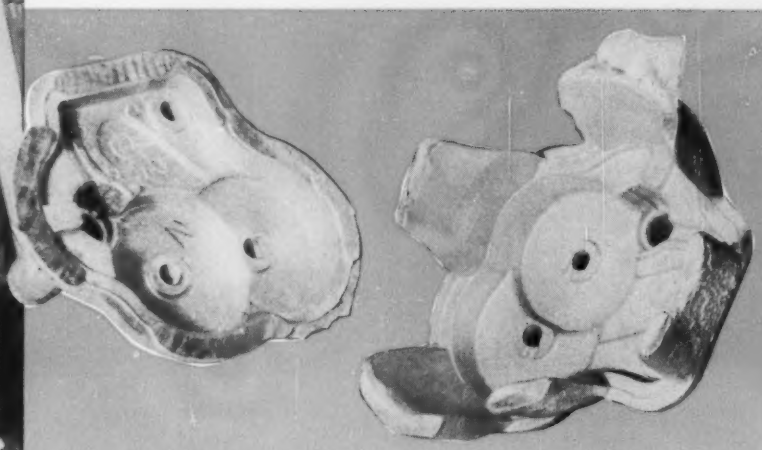
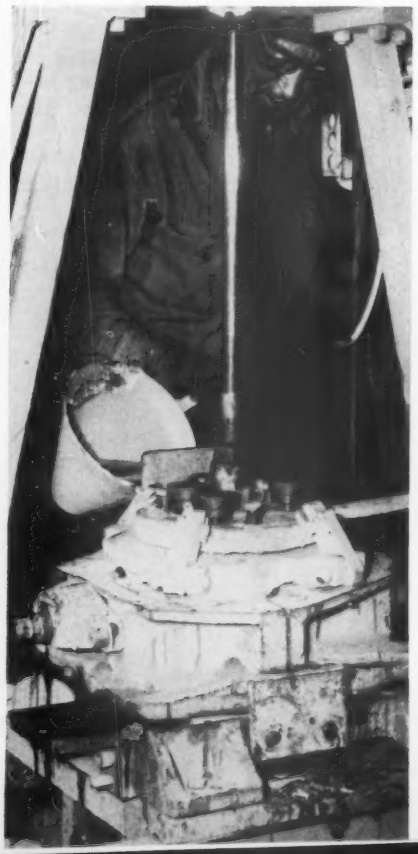


Fig. 3—Left, gear housing ready for machining after milling of gates and risers. Right, as cast with gates and risers on flange

Fig. 1 (above)—Casting is removed from open mold. Notice design of the base plate, two side segments, top core, core rods, and hydraulic cylinder. Fig. 2 (below)—Closed mold is poured. Ladle is made of stainless steel with a mold coating applied to it for protection



Permanent Mold Casting of Aluminum

. . . at the Maytag Co.

Conversion of its aluminum foundry from sand to permanent mold casting presented many problems to Maytag Co. Today, with the changeover completed, the firm feels that the new operation has paid off well

By C. B. CURTIS
Chief Plant Process Engineer
Maytag Co.
Newton, Iowa

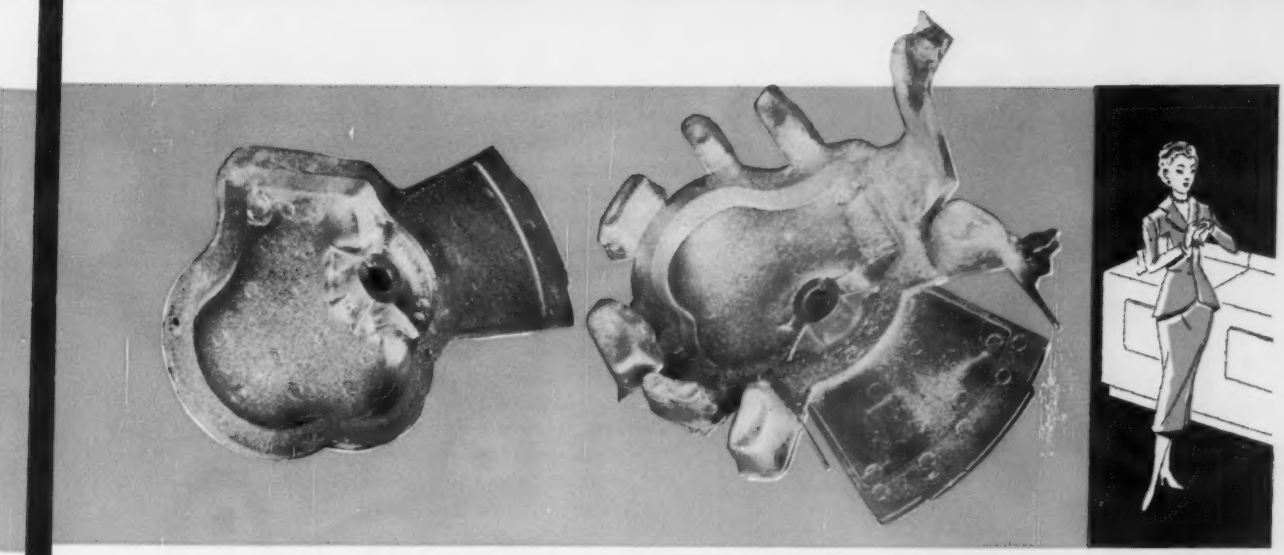


Fig. 4—Left, gear housing cover after gates and risers have been removed. Right, as cast with gates and risers on edge of flange

PERMANENT molding of aluminum castings is a relatively new achievement for Maytag Co. We long were identified with the aluminum industry as a large, captive sand foundry, but after we had cast well in excess of 400 million lb of aluminum sand castings, we turned to another method of fabricating castings. Thus we adopted a plan to convert all castings designed for new washers into either die or permanent mold casting. This program was started in 1949. By dividing foundry personnel, we carried on both types of foundry operations until 1952, when the transition from sand to metal molds was completed.

The task of retraining personnel was not an easy one. Great as these difficulties seemed at the time, however, achievements have reduced this problem so that the program is pretty much a routine operation. The results have yielded high-quality, low-cost castings.

In our permanent mold operations, we presently have on the production schedule two castings, the gear case and the gear case cover. These castings make up the very heart of the washing machine structure and require high quality. We felt that they could be produced most economically by the permanent mold process.

Mold Design—A modern foundry mechanization program attempts to provide facilities which will improve working conditions and produce a uniformly high-quality product which is competitive on the open market. These considerations comprised the basis for our mold designs. It was believed that the castings would remain the same long enough to warrant the capital expenditure involved.

The selected mold design departs considerably from the vertical, book-type mold used by most shops, as shown in Fig. 1. The casting cavity is horizontal, and the hub sections are in the bottom half of the cavity. Pouring sprue, gating, and risers are on the periphery of the outside rim. There are four main segments—the bottom or base; two side segments, which form gating, riser, and pouring sprue cavities; and the top core segment, which forms the inside or top of the gear case. The casting for the gear case cover is made with the same mold design arrangement. The hub is placed downward, and the top segment is used to core out the inside of the casting cavity.

Molds are operated hydraulically by an individual pump system for each mold machine. Each cylinder is activated in proper sequence, and control, which can be either manual or automatic, is through a system of a program-type timer and solenoid valves. The hydraulic fluid is a nonflammable, water-base fluid at approximately 750 psi. The timer is started manually immediately on completion of pouring. After a set time, the top segment or core and all core rods raise or are withdrawn, leaving the casting in the base.

After a further time interval, the two side segments move to open position. Subsequently, a cylinder in the base actuates, ejecting the casting to a position easily reached by the operator. The operator can actuate any separate cylinder manually. On automatic control, this design provides the operator with a time and sequence-controlled cycle which, after the rhythm of the operation and the solidification cycle have been established, can be reproduced repeatedly throughout the shift.

Molds Are Cooled Selectively—Core rods, inserts, and vents are made of hardened tool steel. Recently, the replacement cavities have been made from hot-worked tool steel. Selective cooling of a mold to provide progressive solidification of the metal often is a problem, perhaps greater in the use of a horizontal mold than it would be with a vertical, book-type mold. In any event, the problem usually can be solved by the use of various coatings within the cavity, controlled air streams directed to strategic external areas of the mold cavity, and water-cooled plug inserts.

Generally, air cooling suffices. Low-pressure air delivered from a 24-oz blower is directed

Fig. 5—Reverberatory furnace is used to remelt baled sheet trimmings and alloy to specifications

through ducts and shrouds to troublesome areas. When it can be used, air is preferred to the use of water plugs since it reduces thermal shock to the mold body and eliminates the expense of maintaining the water-cooled plug. When it is necessary to reach a critical internal area of the mold, the cavity base is drilled out at that point, and a plug-insert is installed through which a controlled flow of soft or treated water is circulated for cooling.

Other types of chills, such as chrome-plated copper and air-finned steel inserts, have been tried, but were found to be less successful and to present maintenance problems. Fig. 2 shows a closed mold about to be poured.

In the design of these molds, two concepts of gating were employed. In the gear housing, Fig. 3, pouring sprue and risers are on top of the flange of the casting. These are cut from the casting by a milling cutter-type machine as a part of the first machine operation. In the gear housing cover, Fig. 4, pouring sprue, gates, and risers are located around the edge of the flange and are broken off easily while the casting is warm. These measures have eliminated costly sawing operations and were the main reason that molds were designed for horizontal pouring.

Mold Operation — Perhaps the most important factor in operating a well designed mold is the ability of the die setter and the operator to use mold coatings properly. Extreme care must be exercised in cleaning a mold and in applying the respective coatings. In our shop, the die setter is responsible for cleaning the mold and recoating. Rotating wire and hand brushes are used carefully to remove all coating. The mold then is preheated by gas burners designed to fit the contour of the molds. After the mold has been preheated to about 350° F, coatings are sprayed or hand painted onto the mold in several progressive layers, according to the respective areas. Masks are employed to coat the separate areas selectively.

Three types of coatings are used. On the general casting cavity, a medium-weight coating of a mixture of fine silocel and clay in sodium silicate and water is used. For the core pins, web sections, and areas where little draft or taper is possible, or where a medium chill is desired, a lightweight coating of a mixture of graphite and aluminum oxide in sodium silicate and water is used. On the riser, pouring sprue, and gating runner areas, a heavy insulating coating of a mixture of asbestos, silocel, and clay in sodium silicate and water is used. After starting a recoated mold, the operator may, from time to time, have to touch up a localized area. After he gains experience, he can, by close observation of the casting appearance, manipulate the coating easily and adjust his touchup requirements to control the directional solidification necessary to give best results.

Full use of laboratory physical tests at the initial starting of the mold aid in setting up the mold cycle, mold coating technique, and mold gating design. The castings are checked by x-ray fracture, and macroscopic cross-sectional studies to assure that the quality desired has been achieved. These control data then are formalized and become a part of the process control record.

Maintenance, repair, alterations, and replacement of mold sections are provided for by the toolroom, a staff service division. Having a fully equipped toolroom at hand makes it possible to achieve a maximum production schedule with a minimum of mold facilities. Toolroom personnel work closely with foundry personnel and aid considerably in expediting a change or mold repair order.

Alloy Practice—It long has been the practice of Maytag Co. to make efficient use of all turnings, trimmings, and other aluminum scrap whenever possible. This program requires the use of a remelt furnace, an alloying furnace and complete analytical control facilities. The basic alloy used for permanent mold castings is 4.5 per cent Cu, 6 per cent Si. The bulk of metal requirements is purchased from several suppliers as secondary ingot. Approximately 10 per cent is remelt metal generated in other departments.

Since other alloys are used within the plant, remelt metal must be alloyed by diluting it with pure metal and adding copper, silicon, or whatever else is necessary to keep the metal within specifications. Fig. 5 is a view of the reverberatory alloy furnace used to remelt baled sheet trimmings and to alloy to specifications. Because the remelt program is kept current from day to day, it is possible to keep the accumulation of turnings, trimmings, baled scrap, etc., to a minimum and to achieve maximum yield by eliminating oxidation of chips and similar corrosion losses which occur in the handling of aluminum scrap.

Melting Practice—The melting division is given an assigned charge sheet designating the proportions and lots of metal assigned for use. This card is prepared by a laboratory technician in charge of the alloy program. The metal loader and the melting foreman then are responsible for making out the melt record, which describes the exact weights of each class of metal used in the charge. This is made in duplicate, with one copy for the

foundry office and one for the control technician.

After melting down, metal is fluxed, skimmed, and again brought to control temperature, at which time it may be transferred to a holding furnace. The transfer is made with a cast iron ladle mounted on a motorized fork truck which will transfer approximately 500 lb of molten aluminum at a time. This ladle is tilted for pouring into the holding furnace, Fig. 6, by a system of cantilevers, stop brackets, and the elevator mechanism on the truck. The truck operator can position the ladle from the driver's seat.

The holding furnaces are two-chamber electric induction units. One chamber receives the molten metal charge, and the second serves as a ladle reservoir for the mold operator. This type of furnace is useful for assuring metal at an accurately controlled temperature, without dross or an excess of included gas. The units are controlled automatically by a thermocouple immersed in the metal bath so that temperature does not vary more than 5° F. Turbulence caused by the induction energy assists in avoiding segregation when metal is held for prolonged periods and assists in separating dross and oxides from the metal.

Macroscopic study of gas inclusion porosity of

Fig. 6—Ladle mounted on a fork truck transfers 500 lb of molten aluminum into the holding furnace by a system of cantilevers, stop brackets, and the truck elevator

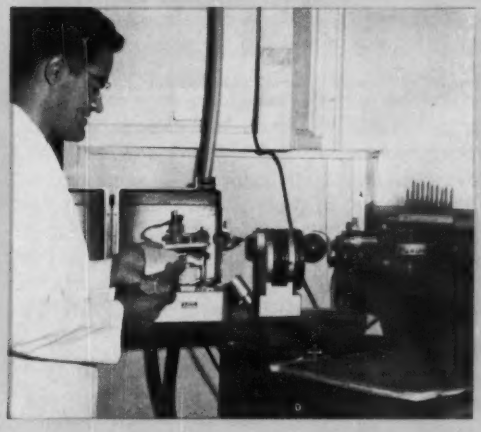


Fig. 7—Metal sample on spark stand of spectrograph is given routine analysis

Fig. 8—Gravimetric analysis of aluminum samples in the chemical laboratory

specimens cast under vacuum yields valuable evidence about the effects of melting, fluxing, transferring, and holding the metal. Specimens show a decreasing amount of gas content throughout the sequence of operation, except for the period immediately following transfer. With this test, one easily can pinpoint poor or abnormal furnace care, inadequate fluxing, and abnormal metal sources. Our mold and gating design make gasfree metal desirable.

The metal preparation program is supported by the laboratory, which gives staff service by making frequent routine analysis of the metal. All metal from outside suppliers also is subject to analysis to confirm that it complies with specifications. For this work a spectrograph is used, Fig. 7, and is supported by a chemistry laboratory, Fig. 8, for setting up original standards or for checking elements not regularly verifiable by spectrographic methods.

Of interest is a performance chart, Fig. 9, kept jointly by the foundry and process engineering. This chart shows the results of leaker castings plotted against metal source. This control has been most useful. It will be noted here that once a poor metal does get into the line, it takes considerable time to get rid of the inoculating effect on other metal sources. When this problem arises, we simply make a thorough house cleaning and divert the metal ingot, in-process scrap, etc., into other, less critical uses.

Another perplexing problem which sometimes occurs during metal preparation is segregation of complex alloy constituents. The segregation consists of a complex iron - manganese - aluminum crystal which is extremely hard. Perhaps it is better known to foundrymen as buckshot. It plays havoc with machine tools, and the source is not definitely known. It seems to occur with prolonged holding of metal at low temperature, without agitation, and perhaps in the presence of a poorly cleaned furnace lining. To get rid of the condition, the meltdown furnace and all molten metal handling equipment are cleaned thoroughly, and prolonged holding at low molten metal temperature is avoided.

Finishing—With a good mold design, finishing of castings should be relatively simple. Gates and risers are removed either by breaking or by the first machine operation. Little or no snag grinding is employed. The castings flow from the line in which the gates and risers are removed to the inspection bench, where they are subjected to a visual check, and then to a test fixture where a 100 per cent air pressure test at 15 psi is made while the castings are submerged in water. Acceptable castings are passed to the machine line. Machining thus is performed on an unaged casting, often only an hour or two after pouring. Since variations in control show up promptly at the machine line, it is important that close co-ordination be maintained through the use of rigid process control on all phases of the foundry project.

The following advantages stand out for the permanent mold process at Maytag.

1. Permanent molding economically has provided a high-quality, high-strength structural base for the gear case housing—the basic element of the washing machine. It is believed that the product costs compare favorably with those of any other method of fabricating this design requirement.

2. The permanent mold process fits well into the program of a mechanized foundry. It has given the operator a tool which improves his ability to control variables and gives him a clean place to work. The tool and die departments were found to be adequate in both skill and equipment to handle shaping of new molds and to repair existing molds.

3. The initial tool cost and the replacement costs for the molds and the respective operating fixtures have been reasonable in comparison to the expenses involved with operating high-pressure metal molds.

4. The process has provided an as-cast shape which requires a minimum of finishing operations and permits the use of alloys which machine readily without hardening. These factors aid considerably in reducing in-process inventories.

It is our opinion that the permanent mold process offers much to the foundry that possesses a normal amount of skill and process-control logic and wants to mechanize, to invest only in low-cost tooling, and to produce high-quality castings economically.

This article is adapted from a paper presented at the 1957 Missouri Valley Regional Conference.

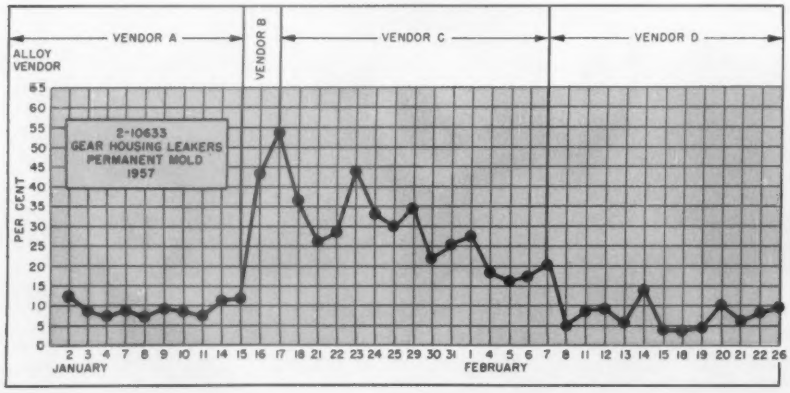


Fig. 9—Chart is kept jointly by the foundry and process engineering. Leaker castings are plotted against sources of the metal

COST ACCOUNTING PROCEDURES...

For the Gray Iron Foundry

The third in Mr. Grover's series on cost accounting, this article continues the explanation of procedures he began last month. Employee and maintenance costs are covered

By ALBERT E. GROVER
Cost Consultant
Cleveland

IN ADDITION to the establishment of normal (standard) costs of depreciation, property taxes, and property insurance (see FOUNDRY, December, 1957, p. 94) other elements of cost consist of salaries, operating labor, employee expenses, repairs and maintenance, power and light, supplies, and other miscellaneous expenses.

Salaries—Salaries consist of compensation to executives, clerks, and foremen. In some manner, the annual compensation of each individual must be included in the development of normal (standard) operating costs.

In a small gray iron foundry, the executives usually include a general manager, one or more salesmen, and a foundry superintendent. Since the general manager supervises all the activities of the business, his salary, office expenses, and traveling expenses are allocated arbitrarily to selling and production costs. Salaries of office clerks and stenographers are included in the costs of the service department established for the accumulation of office expenses. The foundry superintendent's salary is allocated to both producing and service departments on the basis of employee hours. Foundries employing a single clerk to perform all clerical work related to the operation of the foundry should allocate his salary to the departments served, on the basis of hours. Where clerks are assigned to individual departments, their salaries or wages should be included in the operating costs of the departments served.

A foreman's salary is included in the operating cost of the department served. When a foreman supervises operations in more than one department, his salary or wages also should be allocated on the basis of operating hours in each department.

Operating Labor—All labor is divided into two distinct classes—direct and indirect. Direct labor is that which performs the function of the department in which it takes place. Indirect labor is that which does not perform the function of the department, but contributes to the maintenance of the department for functionary work. It would be possible to distribute all indirect labor directly to individual castings produced, but the results would not warrant the expenditure of effort required. Indirect labor costs therefore are included with other items of burden (overhead) for distribution to the product.

Employee Expenses—Usual items of cost included in employee expenses are the following:

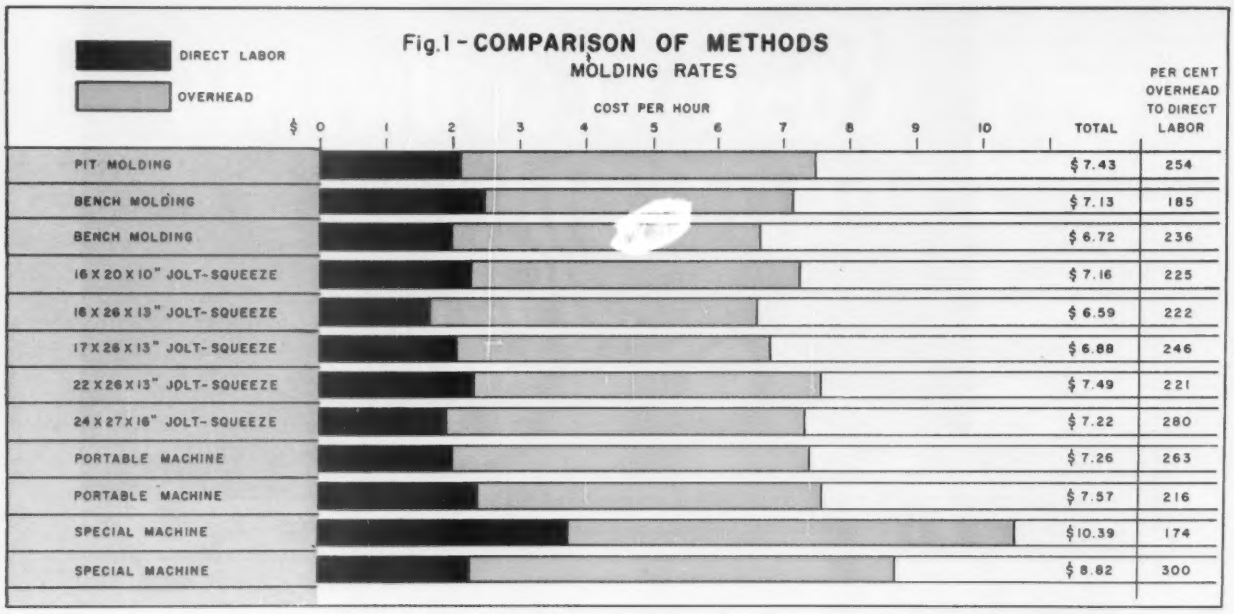
1. Social Security and old-age pensions. Since they are levied on employee earnings, they are distributed on that basis to department costs.

2. The cost of accident compensation is related directly to employee earnings and therefore is distributed to the departments on that basis.

3. Pensions paid to retired employees usually are based on average earnings during a specified period of employment. Since this class of expenditure contributes nothing to current operation of the plant, it should be included with nonoperating expenses in reports to management.

4. Most companies give employees vacations with pay. Since employees are not contributing to producing or service activities while away from the plant, vacation pay should be deducted from earned profits or from the surplus of the company, rather than included in either normal (standard) establishments or current burden (overhead) calculations.

5. Certain expenditures contribute to the welfare of employees actually engaged in operating the plant and office. These include first aid; items of


DIRECT LABOR
OVERHEAD
Fig.1 - COMPARISON OF METHODS
MOLDING RATES
COST PER HOUR
$ 0 1 2 3 4 5 6 7 8 9 10
TOTAL
PER CENT OVERHEAD TO DIRECT LABOR
PIT MOLDING $7.43 254
BENCH MOLDING $7.13 185
BENCH MOLDING $6.72 236
16 X 20 X 10" JOLT-SQUEEZE $7.16 225
16 X 26 X 13" JOLT-SQUEEZE $6.59 222
17 X 26 X 13" JOLT-SQUEEZE $6.88 246
22 X 26 X 13" JOLT-SQUEEZE $7.49 221
24 X 27 X 16" JOLT-SQUEEZE $7.22 280
PORTABLE MACHINE $7.26 263
PORTABLE MACHINE $7.57 216
SPECIAL MACHINE $10.39 174
SPECIAL MACHINE $8.82 300

clothing, etc., necessary for protection from accident or sickness while at work; and the cost of maintaining parking and recreation facilities for employees of the company and visitors.

Repairs and Maintenance—This class of expenses consists of all expenditures necessary for the upkeep of land, buildings, and equipment.

Power and Light—Electrical energy is used for two purposes—for lighting and for power to operate the production facilities.

A few companies have two meters, one to measure energy used for lighting the plant and office and another for measuring energy required to operate producing facilities. Theoretically, the cost of electrical energy for lighting is based on the wattage of each outlet times the time used. This method of distribution is too cumbersome for practical use, and we recommend that this element of cost be allocated to departments on the basis of area lighted.

The cost of electrical energy required for operating the facilities used in production is distributed to producing units on the basis of the rated horsepower for each unit multiplied by the normal operating hours for the period established for the annual normal operation of the foundry.

A similar procedure is used where only one meter is used to measure the cost of electrical energy, except that an estimated cost for lighting is deducted from the total cost, the balance being distributed as power cost.

Supplies and Other Miscellaneous Expenses—These classes of expenses usually are difficult to departmentalize in the establishment of annual normal operation. Often the actual reported costs are in a period not in accord with the hours established for normal operation. A good way to determine a reasonable amount for use in normal establishment is to refer to past records, calculate the cost per hour for each item of expense, and apply the result to the hours for annual normal operation.

Normal Operation (Annual)—Applying the foregoing fundamentals of expense distribution to a small gray iron foundry, we arrive at a simple and comprehensive statement of departmental costs for an annual normal period. Table I illustrates a typical example.

Having arrived at the normal annual operating overhead costs for the five basic departments in a foundry, let us investigate variations in product costs when different methods are used.

Melting—In the allocation of melting costs in

TABLE I—Normal Operation Overhead Expense Rates

	Melting	Coremaking	Molding	Barrel Cleaning	Hand Cleaning
DIRECT CHARGES					
Land	$ 8	$ 8	$ 88	$ 6	$ 15
Building	587	718	7,758	496	1,386
Equipment	3,522	1,510	10,956	3,232	2,635
Employee	1,761	5,440	17,974	839	3,676
General	27,312	22,739	76,845	6,577	8,021
INDIRECT CHARGES					
Parking	405	1,115	3,747	203	710
Office	2,888	6,931	40,428	578	5,198
Storage	1,001	1,816	9,797	95	712
Pattern Shop	.....	2,000	8,570	.....	.....
TOTAL ANNUAL OVERHEAD	$37,484	$42,277	$176,163	$12,026	$22,353
Direct Labor Hours	.....	12,096	34,560	.....	11,368
Overhead rate per hour	.....	$3.50	$5.10	.....	$1.97

gray iron foundries, it often is the practice to divide total melting cost for a given period by pounds of good castings produced in the same period. This method results in accurate product costs only when gates and risers have the same weight ratio to the total weight of metal poured as does the weight of the casting. This condition does not exist in a foundry molding small castings on gated patterns, some of which produce a yield of as low as 10 per cent of the metal in the mold. In this same foundry, other castings may be made with a yield of 90 per cent of the metal in the mold. Still other castings will have yields between these extremes.

Having determined the cost to operate the melting department ($37,484, as shown in Table I), we prepare the following table:

Cost	Yield	Cost per 100 lb
$37,484	10	$3.75
37,484	15	2.50
37,484	20	1.88
37,484	25	1.50
37,484	30	1.25
37,484	35	1.07
37,484	40	0.94
37,484	45	0.84
37,484	50	0.75
37,484	55	0.68
37,484	60	0.63
37,484	65	0.58
37,484	70	0.54
37,484	75	0.50
37,484	80	0.47
37,484	85	0.44
37,484	90	0.42

The average melting cost per 100 lb is 63 cents. Should, for example, this foundry calculate the cost of a 500-lb casting with a 90 per cent yield at the 60 per cent average of 63 cents per 100 lb, the calculated cost per casting would be $3.15, instead of $2.10, or an overcharge of $1.05 per casting, too large a difference to disregard when bidding for business in a highly competitive market.

On the other hand, this foundry, like many other jobbing shops, may have some long-run jobs with yields less than the average—for example, 1 million castings with a 15 per cent yield, weighing ½ lb each, with four castings on a gate. Calculated at the average cost of 63 cents, they would come to $3150; calculated at 500,000 pounds at $2.50 per 100 lb, melting cost would be $12,500. The difference of $9350, due to methods of figuring, is too great to overlook simply to save a small amount of what commonly is called paperwork.

Calculating Core Costs—In calculations of the cost of cores, attention should be given separately to materials, labor, and overhead. As stated on Page 37 of *Cost Manual No. 2* of the Gray Iron Founders' Society, "It should be obvious to any foundryman that Prepared Core Material is raw material for cores just as Melted Metal is raw material for castings. In both cases the cost of raw material in any casting is properly determined by multiplying the pounds of raw material used by the cost per pound of the raw material. There is no more theoretical justification for distributing Core Material Cost on the basis of Core Direct Labor than there would be for distributing Melted Metal Cost on the basis of Molding Direct Labor."

Two simple procedures for calculating the costs of core overhead are described as follows:

1. Divide departmental overhead cost by direct labor cost to arrive at a percentage to apply to each job calculated. If this foundry were to employ this method, the percentage would be as follows: (Annual Overhead) $42,277 ÷ (Direct Labor) $25,402 = 166 per cent.

2. Divide departmental overhead costs by direct labor hours to arrive at a cost per hour to apply to each job calculated. If this foundry were to employ *this* method, the cost per hour would be the following: (Annual Overhead) $42,277 ÷ (Direct Labor Hours) 12,096 = $3.50 per hour.

In this small foundry, there is a spread of $1.50 to $2.10 per hour for coremakers. This spread is caused by varying intricacy of jobs and by piecework. Since there is little relationship between the various elements of costs included in the overhead, the rate per hour is more dependable and requires no more paperwork than the per-cent-of-labor method. The per-cent-of-labor method requires three calculations:

Day Work

1. Hours × hourly wage rate equals labor cost.
2. Labor cost × percentage equals overhead cost.
3. Labor cost plus overhead cost equals total cost.

Piecework

1. Pieces × piece rate equals labor cost.
2. Labor cost × percentage equals overhead cost.
3. Labor cost plus overhead cost equals total cost.

Using the cost-per-hour method, we need the following calculations:

Day Work

1. Hours × production hourly rate equals total cost. Here, labor rate plus overhead rate equals production rate.

Piecework

1. Pieces × piece rate equals labor cost.
2. Hours × overhead hourly rate equals overhead cost.
3. Labor cost plus overhead cost equals total cost.

The foregoing demonstrates clearly that piecework jobs require the same effort to calculate by either method. There is, however, a marked saving in clerical work for jobs on day work.

The fact that each of these methods has been used in the past does not indicate that a better method is impossible. Foundries of all sizes should recognize that three distinct operations are necessary for the production of cores: 1. Preparing Materials. 2. Forming. 3. Baking.

Preparing Materials—Materials are measured for each batch, and the combined cost is entered on a prepared cost sheet. Labor required to process the mixture is determined and also entered on the cost sheet. Next, hourly overhead for the core department is applied to the labor and the result entered on the cost sheet. Now the cost of core material is ready to be made a part of the finished core.

Forming—The direct labor required to form each kind and size of core is determined and entered on the core cost sheet. The overhead charge is established by multiplying the hours required to process the core by the established overhead rate

per hour, and the result is entered on the core cost sheet.

Baking—The fundamentals of effective cost determination for baking cores are so different from those applying to either core material or forming that it becomes necessary to establish a separate cost center for baking.

In a small gray iron foundry, it usually is impractical to allocate the labor required to load and unload each kind and size of core. Such labor, therefore, is included with the other elements of costs when hourly costs are prepared for each oven or furnace.

In calculations of the cost of baking cores, certain principles should be considered: 1. The establishment of the cost to operate the furnace per hour. This cost includes labor, depreciation on buildings and equipment, taxes on buildings and equipment, insurance on buildings and equipment, employee expenses, repairs to buildings and equipment, heat, power, supplies, etc. 2. The time required to bake. 3. The number of cores being baked. When all cores being baked are the same kind and size, it is not difficult to report the number of cores. Often, however, cores of different kinds and sizes are baked simultaneously in the same oven. This procedure complicates the determination of baking costs for each kind and size of core. The author suggests a formula for determining the core costs when this condition occurs: Estimate the number of cores, of each kind and size, that would fill the furnace to economical capacity, then prorate the operating cost of the furnace to the number of pieces of each kind and size baked.

Molding—The manner of preparing the mold to receive molten iron is the same in all jobbing gray iron foundries. Some set up the mold and transport it to the melting facility by mechanical conveyor. Others bring the metal to the mold. In both instances, the method of setting up the mold is the same. Assume that in this foundry, the practice is to bring the metal to the mold.

Measuring the time for molding different kinds and sizes of castings has been and now is generally practiced. There is, however, a divergency in the way overhead, or burden, is applied to molding costs. Most commonly, it is applied as a percentage of overhead to direct labor or as a cost per hour of direct labor.

The use of the percentage of direct labor will produce dependable results only when the following conditions prevail: 1. The same hourly wage rate is paid to molders for setting up molds for different kinds and sizes of castings. 2. The same kind and size of molding facility is used for molding all jobs. 3. The same number of molders and helpers is employed on each job.

These conditions seldom prevail. If dependable job costs are to be had, this method therefore should be superseded by one more fundamentally sound.

There is a decided trend toward mechanization in molding operations. Let us assume that in this foundry, the following types and sizes of molding facilities are used: Pit molding; bench molding; jolt-squeezers 16 x 20 x 10, 17 x 26 x 13, 22 x 26 x 13, and 24 x 27 x 16 in.; and roll-over machines (portable and specially built).

It can be seen readily that there cannot be any continuing relation between the hourly cost to operate these facilities and the labor costs required to set up the molds that require these facilities. Fig. 1 is an example of how rates would differ for the several operating facilities in this foundry. The "Cost per Hour" section indicates the variations in hourly rates for the different facilities. The per cent of overhead to direct labor is shown in the extreme righthand column.

With a spread of $3.80 an hour between the lowest and the highest rates, it would be inconsistent to use an average departmental labor and overhead rate. Similarly, a spread of 126 per cent of overhead to direct labor is too great to disregard in costing molding operations.

A commonly expressed objection to using the hourly cost method of allocating overhead to jobs is the paperwork involved. In fact, however, less paperwork is required to use this method than to use the percentage of overhead to direct labor. In calculations by the hour basis, hourly labor rate plus hourly overhead rate equals total hourly cost to apply to the operation. But three steps are required for calculations by the percentage basis: 1. Operating hours multiplied by the hourly wage rate gives the labor cost for the operation. 2. The labor cost for the operation multiplied by the overhead percentage gives the overhead cost for the operation. 3. The cost of the operation is obtained by adding the labor and overhead.

Fig. 2—Example of Percentages of Overhead to Direct Labor With Varying Molding Facilities

DIRECT LABOR COST

One man to a machine, 1728 hours annually, at $2.15 per hour—$3715

	MEN	VALUE OF FACILITIES	% OVERHEAD TO DIRECT LABOR
FACILITIES			
Pit Molding	9	$5,754	222
Benches	2	300	208
Jolt-Squeezers			
16 x 20 x 10 in.	2	1,400	222 each
17 x 26 x 13 in.	1	1,070	227
22 x 26 x 13 in.	1	3,000	240
24 x 27 x 16 in.	1	4,300	249
Rollover Machines			
Portables	2	7,750	254 each
Specially Built	1	10,000	270
Specially Built	1	15,000	337
AVERAGES BY GROUPS			
Pit Molding	9	5,754	222
Benches	2	300	208
Jolt-Squeezers	5	9,770	232
Rollover Machines	4	32,750	283
TOTALS	20	$48,574	237%

When piecework is the basis for labor calculations, the paperwork is the same for both methods.

Fig. 2 is an example of the establishment of percentages of overhead to direct labor for different molding facilities. A uniform labor rate of $2.15 an hour is used so that the percentage will reflect variations caused by types and sizes of operating facilities. Attention to this example should convince the skeptical foundryman of the importance of analyzing his own method to ascertain whether it is adequate for his needs.

Often the nature of the casting to be molded requires more than a single operator. Attention is called to Fig. 3, which shows what happens to the percentages when one, two, or three employees are used on the operation. It is important that such variations in percentages be recognized and used in calculating the molding costs of different kinds and sizes of castings. Strict adherence to the method of applying overhead as indicated on this example will produce accurate and dependable results. As has been stated before, however, a better method is the use of hourly rates.

Cleaning Castings—Over a period of many years, the author has observed several methods of calculating cleaning costs in gray iron foundries. These include a flat rate per pound for all castings, a percentage of molding direct labor cost, and a percentage of the total molding and coremaking costs.

Any one of these methods would be practical in foundries producing castings of the same kind, size, and weight. Since this condition does not prevail in any foundry, we need an explanation of why any one of these three methods is faulty.

Since there is no consistent relation of labor and overhead to the weight of individual castings cleaned, a flat rate per pound for all castings necessarily results in inaccurate and misleading cost information.

This practice produces dependable cost figures only if the following conditions prevail: 1. All employees cleaning castings by hand earn the same hourly wage, whether on an hourly wage or piecework. 2. There is uniformity in the type of cleaning facilities used. These conditions rarely occur. Therefore it would be better to use hours rather than labor earnings, because most of the elements of cost of this operation are more nearly related to hours than labor earnings.

Although the calculation of cleaning costs as a percentage of molding direct labor was for many years recommended as a simple and effective method, intelligent analysis discloses that its practice could not possibly result in dependable costs in jobbing foundries. Many castings with a high molding labor cost require a small cleaning time. Also, many castings easy to mold are difficult to clean.

The method of using a percentage of the total molding and coremaking costs appears to be so unusable that further comment is unnecessary.

There are two very different methods of cleaning castings. One is to tumble them in a barrel and is designated here as barrel cleaning. The other method involves handling of the individual casting and is designated here as hand cleaning. This method also may include inspecting, sorting, and packing.

A good way to calculate the cost of barrel cleaning is to follow this procedure: 1. Determine the hourly cost to operate each type and size of barrel. 2. Measure the time the castings are tumbled in the barrel. 3. Multiply the time tumbled by the hourly cost to operate the barrel. 4. Divide the pieces or pounds tumbled by the total cost of operating the barrel. This results in the piece or pound cost.

The last two articles have covered procedures for setting up standards. The next in the series will deal with procedures for accumulating actual costs.

Fig. 3—Example of Percentages of Overhead to Direct Labor for One Specially Built Rollover Molding Machine*

ONE MAN ON THE MACHINE

Direct Labor Cost,
1728 hours annually, at $2.15 per hour..... $3,715

COST ELEMENTS	OVERHEAD EXPENSES	% OVERHEAD TO DIRECT LABOR
Building	$ 409	11
Equipment	2,629	70
Employee	900	24
General	8,169	225
Parking	188	5
Office	2,022	54
Storage	490	13
Pattern	2,062	56
Totals	$16,869	458%

TWO MEN ON THE MACHINE

Direct Labor Cost,
1728 hours annually, at $2.15 per hour..... $3,715
1728 hours annually, at $2.00 per hour..... 3,456
$7,171

COST ELEMENTS	OVERHEAD EXPENSES	% OVERHEAD TO DIRECT LABOR
Building	$ 409	6
Equipment	2,629	31
Employee	1,800	25
General	12,253	177
Parking	376	5
Office	2,022	28
Storage	490	7
Pattern	2,062	29
Totals	22,041	308%

THREE MEN ON THE MACHINE

Direct Labor Cost,
1728 hours annually, at $2.15 per hour..... $3,715
3456 hours annually, at $2.00 per hour..... 6,912
$10,627

COST ELEMENTS	OVERHEAD EXPENSES	% OVERHEAD TO DIRECT LABOR
Building	$ 409	4
Equipment	2,629	25
Employee	2,700	25
General	16,293	155
Parking	564	5
Office	2,022	19
Storage	490	5
Pattern	2,062	19
Totals	$27,169	257%

*Machine Value, $17,777 Installed

Questions and Answers

Some details of application of CO_2 process to production of a copper casting are given . . . Brazing operation is leakage cause . . . Suggests method for molding impeller . . . Heat checks in brake drums

Producing a Copper Waterfront

QUESTION We would like to use the CO_2 process for making molds and cores for a cast copper waterfront which must be watertight. Have any articles been published on this particular application? What materials should be used to minimize burn in and porosity?

ANSWER While we have seen no references to making straight copper castings with the CO_2 process, we know of no reason why the process should not function as well as with copper-base alloy castings. As you undoubtedly know, choice of sand for the castings will depend on the desired surface smoothness in correlation with the section thickness. Of course, fine sands require more binder than do coarse sands, so you may want to choose the coarsest sand which will just come within the smoothness requirements. Possibly a sand with an AFS grain fineness number of 70 to 85 might serve.

The sand should be clay-free unless some green strength is desired, and then the clay content may be about 2 per cent. Clay content usually is gained by addition of fireclay, not bentonite. In the case of copper castings the addition of up to 2 per cent seacoal should aid collapsibility. Some operators also add 1 per cent iron oxide for the same purpose.

We assume that your practice in producing copper castings by present methods follows the general procedure of coating cores and mold faces with graphite or perhaps blacking. This practice should be followed in CO_2 molding. Water-base solutions seldom are used, however, because they do not adhere well, tend to give friable surfaces, and, of course, must be dried. Preferable practice is to use volatile- or alcohol-base carbonaceous coatings, brushed on and then ignited.

The most economical molding procedure would be to use the CO_2 sand mix as a facing, backed up with ordinary green sand. A facing 1 in. thick will serve on patterns up to 6-in. depth or height; 2 in. thick for those from 7 to 12 in., and 3 in. for deeper patterns. If the sand mix has some green strength, the pattern can be removed from the mold, and then the face gassed with CO_2 by covering the flask with a board containing a hole for admission of the gassing tube or pipe. A rubber gasket between board and flask edges minimizes gas leakage. Gas pressure ranges from 20 to 30 psi and the time of gassing from 30 to 60 seconds. Overgassing, indicated by whitish deposits on the mold face, should be avoided since it produces friable surfaces and weak molds.

If it is desired to gas the mold before removing the pattern, insert a probe from the top of the mold to within ½ to 1 in. of the sand-pattern interface and gas for a few seconds. The probe may be a piece of ⅛-in. copper tubing, inserted on about 4-in. centers.

From the viewpoints of collapsibility of the sand and economy, the amount of silicate binder used should be just sufficient to give the mold or core the desired resistance to washing and cutting by the molten metal and to handling. With the sand mentioned earlier, a binder content of 4 to 5 per cent should serve, but some experimentation is desirable to determine the most suitable amount.

The sand should be dry and cold, and mixed with the additives in the dry state for about 1 minute. Binder is added, mixed for 4 minutes, and then the mix is placed in closed containers or covered with moist burlap sacking. Loss of moisture during mixing tends toward air hardening, and it is advisable to conduct the operation in a closed mixing unit.

In general, the same sand mix used for molding is employed for making cores. If collapsibility is unsatisfactory, however, it may be advisable to try a mix with just enough binder to permit handling. As in the case of molds, proper gassing of cores is essential, and since they are made in closed boxes, vents may be necessary for complete penetration of the gas. If the corebox is designed so that the top half can be removed without disturbance, the lower half of the box with the complete core can be placed in a suitable chamber for gassing, or enclosed in a polyethylene bag as indicated on Page 106 of the October, 1957, issue of FOUNDRY.

Castings Leak after Brazing

QUESTION We have been making some bronze castings known as headers for one of our customers. The hollow headers are about 18 in. long, rounded-corner, rectangular section, and tapered from about 3 in. to about 1¼ in. Wall thickness is 5/32 to 3/16 in. Two rows of ⅝-in.-diam ports are located on opposite sides, and the header has a full length rib for rigidity. Large end of the casting is tapped for a 1½-in. pipe, and the ports are reamed for brazing in copper tubing. We have made the castings from 85-15 brazing alloy and the 88-6½-1½-4 alloy (Navy M) with proper external chills and risers as necessary to overcome shrinkage problems. Customer tests all castings as received with air pressure under water, and they are sound. However, after brazing in the tubes the castings again are tested, and then they leak—not at any particular location, but almost anywhere. In the brazing operation the castings are located in a reciprocating fixture and move back and forth under multiple burners. Castings are brought up to 1200° F, and the brazing material is 50 Ag-15.5 Cu-16.5 Zn-18 Cd.

ANSWER Without any specimens of the castings in the before and after condition to examine, it is difficult to determine why leakage occurs in apparently sound castings after brazing. One possibility is that the castings are heated to a much higher temperature than the indicated 1200° F. It might be pointed out that your brazing material melts at about 1160° F and flows at 1175° F, so parts to be brazed at a temperature of 1200° F should provide satisfactory results. Melting point of the alloy used for the casting (Navy M) is reported to be 1800° F, but possibly incipient fusion might occur somewhat below that figure.

Another possibility is that while the castings appeared sound in the pretest, some shrinkage porosity in the dispersed form was present, and under the elevated temperature conditions the dispersed form was broken down into the interconnected channel type of shrinkage porosity which resulted in leakage.

Presence of internal shrinkage can be determined by radiographic examination or by fracturing, and it will be worthwhile to use either procedure before making any more castings. Through such examination you can locate the troublesome areas, and make suitable changes in gating and chilling if required, to overcome the difficulty.

Shell Molding for Impellers

QUESTION One of the products of our foundry here in India is a line of small cast iron centrifugal pumps, and we are enclosing two drawings of typical impellers for them. We are interested in producing the impeller molds and cores by the shell molding process. Will you please advise us on the requisite construction of the corebox and the necessary arrangement for lifting up the cured shell from the corebox?

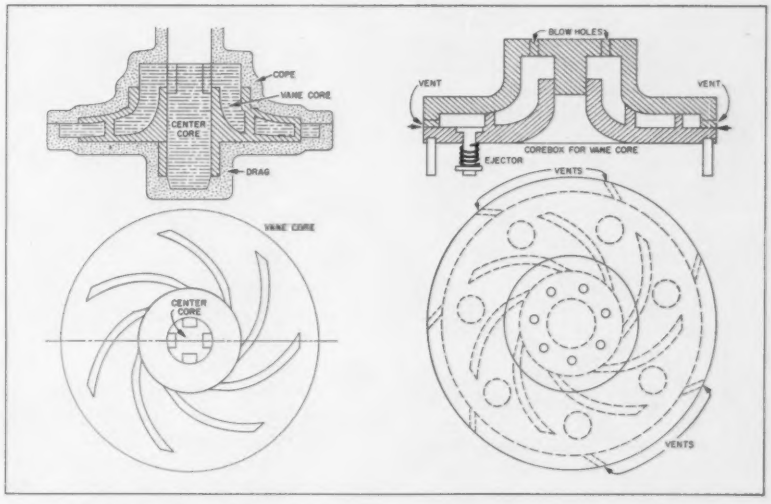
ANSWER In the accompanying sketches we are giving our conception of a method of making the impeller cores as well as the general arrangement. While the mold halves can be made by the dump box method, using a dry resin-sand mix, the cores will have to be blown with a resin-coated sand.

You will note that the main core has a rim around the edge and an extension at the top with a hole in it. The rim and extension are to provide rigidity, while the hole in the top is for the admittance of a separate center core to form the shaft opening in the casting. The center core contains grooves or slots at the top portion which form gates for entrance of metal into the mold cavity.

Although not much difficulty is encountered in straight-away blowing operations, trouble sometimes is encountered where the sand has to go around corners or curves. Hence, a number of small blowholes are suggested at the top—one for each vane—and a similar number of vents are indicated just off the tips. All of them may not be necessary, and we suggest that you first try a few and observe the results.

To remove the hardened core from the box, the spring-loaded, headed type pin such as is commonly used for ejectors in shell molding operations should function. One of these pins is indicated in the bottom half of the corebox; a sufficient number should be used to insure lifting the core without breakage. Placing of the ejectors on the bottom half is based on the assumption that the core will tend to adhere to that portion. It is possible that the core may adhere to the top half, however, and then the location would have to be changed. Before placing the ejector pins, it is suggested that you make a number of cores to determine to which side of the corebox the cores will adhere, and then place the ejectors accordingly.

With reference to patterns and corebox for the impellers, it might be pointed out that the surfaces which come in contact with the sand should be smooth and highly polished. Any undercuts, dents, etc., will make it difficult or even impossible to remove the formed part.



Illustrations portray various details of a suggested procedure for production of cast iron impellers by shell molding process

Automobile Brake Drums Crack

QUESTION Our normal production is cast iron brake drums made in our own plant in Brazil, but they are cracking regularly when in use. Analysis of the drums shows 3.0 per cent TC, 0.60 per cent Mn, 2.60 per cent Si, 0.39 per cent P, and 0.03 per cent S. The iron is melted in a direct-arc electric furnace and the drums are not heat treated. If possible we would like to know the analysis most appropriate for electric furnace iron for brake drums. What special element such as Ni, Cr, Mo, etc. should be added? What about heat treating? If the material analyses are equal why should the properties of castings made from electric furnace iron differ from those made from cupola iron?

ANSWER While your reference to cracking is not quite clear, we assume that it means the appearance of fine cracks or checks on the operating surface, rather than fracture cracks. The former result from thermal shock, and the latter probably from internal casting strain which may be eliminated by stress relief treatment at about 1000° F and furnace cooling.

As to resistance to thermal shock, the consensus is that cast iron brake drums with high total carbon content give the most satisfactory results. This belief is indicated in automotive specifications requiring a minimum of 3.40 per cent total carbon in gray iron castings for brake drums and clutch plates.

Silicon range is given as 1.10 to 1.70 per cent, manganese 0.60 to 0.90 per cent, sulfur 0.14 per cent max, and phosphorus 0.20 per cent max. Physical properties of brake drums for moderate service are designated as 30,000 psi min tensile strength and 179 to 229 Brinell hardness number. For heavy-duty drums the tensile strength is 40,000 psi min, and Brinell hardness number 207 to

269. Microstructural requirements for the drums also are included.

For moderate service the graphite is to be type A (uniform distribution, random orientation), size 2 to 4 (flakes from ½ to 4 in. long), and the matrix lamellar pearlite with ferrite, if present, is not to exceed 15 per cent. For heavy-duty service the graphite is to be type A, size 3 to 5 (flakes from ¼ to 2 in. long), and the matrix lamellar pearlite with excess constituent, free cementite or free ferrite, or both, not to exceed 5 per cent approximate.

Alloying agents such as copper, chromium, molybdenum, and nickel are added to the base composition mentioned to produce desired strengths and other characteristics. Those alloys generally are used in combination rather than individually, and amounts may vary from 0.25 to 0.50 per cent and sometimes higher.

In your case it appears that it would be wise to change your brake drum composition, at least in carbon content if nothing else, to reduce the tendency toward heat checking or cracking. It should not be too difficult to increase the carbon content in electric furnace melting either by using higher carbon content metallic materials or by placing broken pieces of electrode stubs on the furnace bottom and the metal components on top.

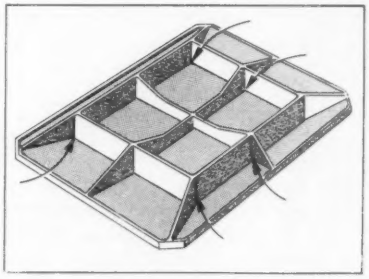
We believe that differences in properties of irons or castings made by electric furnace and cupola melting to be due primarily to differences in microstructures. Electric furnace irons usually reach much higher temperatures during melting than in cupola melting, and are subjected to the higher temperature for a longer period of time. The combination of high temperature and time of exposure leads to undercooling, which results in precipitation of fine graphite rather than the normal flake graphite during solidification. Undercooling can be prevented by small addition of ferrosilicon or other graphitizing agent in the ladle, a practice known as inoculation.

Shrinkage Appears in Corners

QUESTION We have a molding problem on which we would like some advice. It pertains to aluminum alloy bottom boards of the general shape indicated in the accompanying sketch. Trouble is shrinks in the portions indicated by the arrows. Alloy is melted in iron pots and poured at 1350° F. We have rammed molds from very soft to extremely hard. Sprue is about 1¼ in. in diam and has been placed in different locations. We have tried it on one end with a single gate, on one end with a double gate and riser opposite, on the top feeding into two risers, on the top near one edge with a riser opposite near the other edge, etc. We also have tried sand so dry that it washes and sand so wet it bubbles. How can we eliminate the shrinks in the corners?

ANSWER Your problem of shrinky areas is not uncommon at the junction of differing section thicknesses, and is the result of the differences in cooling rate between them. The lighter of the two sections freezes before the heavier section, cutting off the flow of metal to feed or fill the later occurring voids resulting from the decrease in volume in the change from liquid to solid state. The condition may be cured either by supplying molten metal to the areas where shrinkage occurs or by changing the cooling rate so that both types of sections solidify at about the same time.

It is obvious that the simplest and least costly method of eliminating the shrinkage will be to change the cooling rate since it can be accomplished by placing small chills at the areas where the trouble occurs. The chills should not be any larger than necessary to increase the cooling rate of the heavier sections to the desired extent. If they are too large they will defeat that aim by also increasing the cooling rate of the adjoining thinner sections. Try chills of the same face area as that of the junction of the sections.



Shrinkage in bottom board casting is located at areas indicated by arrows

You mention that you tried various methods of gating these castings without any success. While there is a possibility of eliminating the shrinks by a change of gating, we doubt if it will overcome it entirely, but it might make it less apparent, particularly on the surface. In any event we would recommend a change in gating, other than those you mention, to obtain a better casting. Try placing a runner along one of the long sides of the casting, with a number of small ingates from the runner into the casting.

Preferably the runner should be in the drag, with the ingates in the cope. Place a taper sprue at the center of the runner. It might be well also to make an enlarged basin or reservoir in the drag beneath the sprue to reduce turbulence. Use of the centrally located sprue, runner and several ingates permits shorter flow of metal and more rapid filling of the mold. Also it should permit use of lower pouring temperature. Possibly the use of such a gating system with lower pouring temperature may eliminate the exterior evidence of shrink, but not the interior shrink. That can be ascertained only by fracturing the casting at the various junction points.

Pouring Temperature for Alloy

QUESTION We will appreciate information on the pouring temperature for the No. 12 aluminum alloy containing 8 per cent copper and 92 per cent aluminum.

ANSWER As in the case of practically all alloys used in the production of castings, there is no one definite pouring temperature for the No. 12 aluminum alloy. In general, the lowest possible pouring range which will provide full-run, sound castings usually provides the best physical properties, and it always is good policy to determine that range experimentally. Also, temperature of the metal on tapping should be just sufficiently high to permit the metal to arrive at the mold side at the determined pouring range. That temperature can be determined by a few checks on your regular routine pouring practices.

Pouring temperature may vary from 1200 to 1450° F. It depends primarily on section size and intricacy of the castings to be made. Usually lower pouring temperatures may be employed when the gating system includes multiple gates than when it has one or two gates. Multiple gates reduce sand troubles caused by erosion, and permit more rapid fill up of the mold.

Attempting to pour too many small-sized castings from one crucible of metal is not good practice since the metal usually is too hot for the first and too cold for the last. Two practices which will correct such a condition are 1) melting in one crucible only enough metal to pour a certain number of molds, based on the metal temperature drop from first to last mold, and 2) setting up a series of molds requiring different pouring temperatures. Molds needing the highest temperature are poured first, followed by others requiring lower temperatures.

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● PAUL W. HAYNES
join Pusey & Jones Corp.

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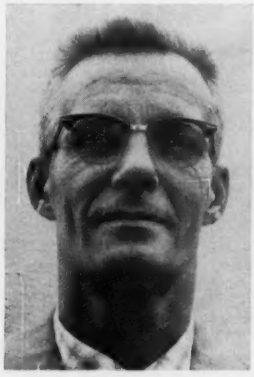

● PAUL E. EUBANKS
. . . heads AFS chapter

JAMES L. YATES has been appointed chief foundry engineer in the methods and equipment division of Crane Co., Chicago. Graduated from Massachusetts Institute of Technology, Mr. Yates was with the Worthington Corp. for 27 years before joining the National Engineering Co., Chicago, in 1946. With National he served as foundry engineer and later as district manager of its midwest territory.

● **Robert F. King** has been appointed superintendent, Bridgeton Foundry, Bridgeton, N. J. He was associated with Central Foundry Co. and M & H Valve & Fittings Co., Anniston, Ala., and later became assistant superintendent, Tennessee Coal, Iron & Railroad Co., in Alabama. Until the foundry closed last year he was superintendent, Watson Co., Bowie, Md.

Glenlyn H. Blackburn has been appointed foundry manager, W-K-M Div., ACF Industries Inc., Houston. For the last 22 years he was associated with Walworth Co., Greensburg, Pa., where he had been superintendent of foundries since 1952. **Revos E. Burge** has been named foundry personnel manager of the division. He was formerly personnel director, Medart Mfg. Co., St. Louis.

Fred N. Heuchan has been elected president, Walker Metal Products Ltd., Windsor, Ont., succeeding **Harold M. Gregory,** who has retired after 40 years with the company. **Harvey J. Miller** has been named vice president-general manager.

● **Elwood C. Conary** has been appointed general superintendent, and **Paul W. Haynes,** chief metallurgist, Pusey & Jones Corp., Wilmington, Del. Prior to joining the company in 1956 as foundry manager, Mr. Conary was general manager, Genesee Foundry Co., Syracuse, N. Y. Mr. Haynes was with Crompton & Knowles Corp., Worcester, Mass.

Harold A. Muttach has been named works manager, Granite City Steel Co., Granite City, Ill. **Frank J. Burgert** has succeeded him as divisional superintendent of coke ovens, blast furnaces, open-hearth furnaces and foundry. In 1924 Mr. Muttach joined St. Louis Coke & Chemical Co., forerunner of Granite City Steel. Mr. Burgert had been his assistant until the promotions.

John R. Shumway, partner, C. W. Shumway & Sons, Batavia, Ill., was elected president, Chicago Foundrymen's Association for 1958. Other officers elected and their Chicago affiliations are: **H. R. Erickson,** Noonan-Malmstrom Co., vice president; **John K. Hodgson,** Hodgson Foundry Co., secretary-treasurer; **C. M. Johanson,** Mid-City Foundry Corp., a director. **Mildred Kosar** is executive secretary.

George E. Kuck, formerly manager of the materials laboratory, Lycoming Div., Avco Mfg. Corp., Williamsport, Pa., has been appointed manager of the Metallurgical Instruments Div., Intercontinental Electronics Corp., Mineola, N. Y.

● **Paul E. Eubanks,** chairman of the Central Ohio Chapter of the AFS for 1957-58, since 1949 has been chief inspector, Ohio Steel Foundry Co., Springfield, Ohio. He attended University of Cincinnati and joined Ohio Steel in 1943, becoming metallurgist in 1946. Mr. Eubanks was treasurer of Central Ohio Chapter last year.

Niels A. Olsen has been appointed director, Metalworking Equipment Div., Business and Defense Services Administration, Washington. Since 1954 he has been deputy director of the division in development of mobilization and business service programs. Previously he was with the Air Force, the War Department General Staff, and in active military service.

Richard Ridgley, former superintendent of the Shellcast plant of Electric Steel Foundry Co., Portland, Oreg., now is foundry superintendent of the new Esco Ltd. foundry at Port Coquitlam, B. C., Canada. Mr. Ridgley supervised final construction and equipment installation at the Port Coquitlam facility. Esco is a subsidiary of Electric Steel Foundry Co.

Donald D. Bowman and **Arnold Rogers** have been elected vice presidents, Almont Mfg. Co., Imlay City, Mich. Mr. Bowman, with the company since 1940, has served as metallurgist, office manager, sales manager and is now general manager. Mr. Rogers has been with Almont

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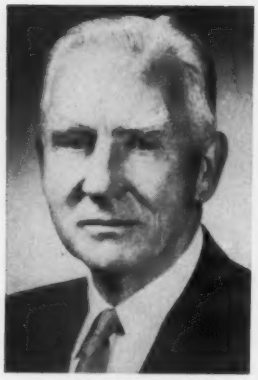

● THOMAS E. MOFFITT

. . . becomes Hooker pres.

● E. F. MITCHELL

. . . Vitrified Wheel v. p.

since 1920, beginning as a molder when the plant was located in Almont, Mich., later as coreroom foreman, superintendent, and now as foundry manager.

● **Carl L. Liebau** has been named chairman of the board, Federal Malleable Co., West Allis, Wis. **Norman N. Amrhein,** since 1955 vice president-secretary, has succeeded him as president. Mr. Liebau joined the company in 1934 and since 1945 has been chief executive officer and general manager. He is a past president and director of Malleable Founders' Society. Mr. Amrhein is president of the Wisconsin Chapter of the AFS. Other appointments at Federal Malleable include **Felix J. Huwiler,** vice president-sales; **Thomas F. Slattery,** vice president - treasurer; **Thomas Teetor,** general superintendent; **Harold T. Hoak,** plant metallurgist; **Herman L. Wintheiser,** supervisor of technical sales. **C. A. Stegmeyer** continues as assistant treasurer.

● **Alex E. Ainlay,** formerly a northern California district representative, Pettibone Mulliken Corp., Chicago, has been named western regional manager, with headquarters in San Francisco. **Clem C. Persily** has joined the company as midwest regional manager, to be located in Chicago.

● **Thomas E. Moffitt** has been elected president, Hooker Electrochemical Co., Niagara Falls, N. Y., succeeding **Bjarne Klaussen,** who continues as director. Mr. Moffitt recently has been a director and executive vice president.

Paul Zoffmann has been appointed technical director, Sam Tour & Co., and its affiliate, American Standards Testing Bureau, New York. He will supervise the chemical and metallurgical laboratories for the two organizations.

● **D. C. Card,** chairman of the Timberline Chapter of the AFS for 1957-58, for six years has been president-general manager, C. S. Card Iron Works Co., Denver, which supplies standard and special equipment to the mining industry. Mr. Card joined the family firm in 1946, working in various departments, including the foundry. He was vice chairman of Timberline Chapter last year.

● **E. F. Mitchell** was recently appointed vice president-general manager, Vitrified Wheel Co., Westfield, Mass.

R. P. Mosley has been named sales representative for the Houston territory, Electrode Div., Great Lakes Carbon Corp., New York. **H. T. Thompson,** former development chemist of the division's technical department, has succeeded Mr. Mosley as customer service representative. **William G. McFadden,** who has been at the company's Morganton, N. C., plant, has been named sales office manager of the Electrode Division's New York headquarters.

E. P. Pool, since 1951 research engineer, Edward Valves Inc., subsidiary of Rockwell Mfg. Co., East Chicago, Ind., has been named chief research engineer. **Wilbert G. Hegener** has been named research and engineering co-ordinator, and **Harold N. Myers,** research metallurgist.

● **Richard H. Thompson** has been appointed manager, foundry sales, Climax Molybdenum Co., New York. Previous connections include Ameri-

● CLEM C. PERSILY

● ALEX E. AINLAY

regional mgrs., Pettibone Mulliken

● D. C. CARD

. . . heads Timberline Chapter

● RICHARD H. THOMPSON

. . . foundry sales mgr.

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can Car & Foundry Div., ACF Industries Inc., and International Nickel Co., both of New York.

● **Ralph C. McMillan,** former assistant chief engineer of the Pershing Rd. plant, Link-Belt Co., Chicago, has been appointed chief engineer there, succeeding **Joseph J. Richard,** who will handle special engineering assignments for the company's executive office. **David A. Davis,** who has been divisional engineer of the Pershing Rd. plant, has been appointed chief engineer of the Caldwell plant. Mr McMillan has been with the company since 1927. Mr. Davis joined Link-Belt in 1929.

● **William H. Oler** has been appointed sales manager, Engineering Div., Hauck Mfg. Co., Brooklyn, N. Y. An engineering gradute of Yale University, he was formerly regional sales manager for the company in western Pennsylvania, Ohio and Michigan.

Joseph W. Tierney, manager of the plastic tooling division, has been elected a director, Houghton Laboratories Inc., Olean, N. Y. **Mark V. Goodyear,** technical director, has been named a director of Hysol (Canada) Ltd., an affiliate of Houghton.

Gordon E. Chase, formerly sales engineer, Pivot Punch & Die Corp., North Tonawanda, N. Y., has joined Manco Products Inc., Melvindale, Mich., to cover Ohio, Indiana, New York, and western Pennsylvania, with headquarters in Buffalo.

Donald C. Giles, formerly Seattle branch manager, Pure Carbonic Co. Div., Air Reduction Co., New York, has been appointed district manager in Berkeley, Calif. He joined the company in 1946.

● **Robert Cushman** has been named manager-marketing services, and **W. Alexander McCune Jr.,** manager-field sales, Abrasive Div., Norton Co., Worcester, Mass. Mr. Cushman joined the company in 1944, became west coast district manager in 1952, and since 1955 has been assistant sales manager, grinding wheels. Mr. McCune, with Norton since 1940, for the last four years has been general sales manager, Norton Co. of Canada Ltd., Hamilton, Ont.

● **Robert P. Stuntz** has been appointed assistant sales manager, Babcock & Wilcox Co.'s Refractories Div., with headquarters at executive offices in New York. **Robert H. Forsyth** has been named manager of the division's Chicago district sales office. Mr. Stuntz joined the company in 1940 and has been Chicago district sales manager since 1951. Mr. Forsyth, with B & W since 1946, was assigned to New York refractories sales in 1952, and to the Pittsburgh sales office in 1953.

Amos J. Shaler, professor and head of the metallurgy department, Pennsylvania State University, University Park, Pa., is the 1957 winner of the annual $2000 metallurgy teaching award given by the American Society for Metals for the best teaching performance in the engineering curriculum.

● **Howard E. Voit,** chairman of the Metropolitan Chapter of the AFS for 1957-58, is district manager of the eastern office, Sterling Wheelbarrow Co., Hackensack, N. J. He joined the company in 1946 and later that year was transferred from the sales de-

● WILLIAM H. OLER

. . . becomes sales mgr.

● ROBERT CUSHMAN

● W. ALEXANDER McCUNE JR.

Norton Co. marketing-sales appointments

● HOWARD E. VOIT

. . . AFS chapter chairman

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★ ★ ★

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- ✓ I resolve to learn from the lessons of the past to apply them to the conditions of the present and of the future.
- ✓ I shall personally explore the economy and efficiency of *Famous* **CORNELL** CUPOLA FLUX, the fluidizer known for providing for cleaner iron.
- ✓ I shall do it today by calling a CORNELL Engineer.
- ✓ I resolve not to accept substitutes.

January 1958

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12	13	14	15	16	17	18
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● **JOHN J. UPPGREN**
. . . AFS Chapter Chairman

● **WILLIAM J. McGRAW**
. . . general sales mgr., Thor

● **WILLIAM C. MILLER**
. . . becomes sales mgr.

● **J. D. HARMISON**
. . . material handling sales

partment in Milwaukee to New York where he became branch manager. When the office was moved to Hackensack in 1951, he continued as eastern branch manager. Mr. Voit was Metropolitan Chapter's vice chairman last year.

● **John J. Uppgren,** chairman of the Twin City Chapter of the AFS for 1957-58, is foundry manager, Northern Ordnance Inc., Minneapolis. He was graduated from University of Minnesota in 1943 and received a master's degree in metallurgy there in 1949. Mr. Uppgren was an instructor of mechanical engineering at the university from 1946-51 when he joined Northern Ordnance. Last year he was vice chairman of Twin City Chapter.

Carl F. Leitten has been named president, Electro Refractories & Abrasives Corp., Buffalo, and its Canadian subsidiary of the same name at Cap de la Madeleine, Que. **Grant S. Diamond,** for the last 14 years president of the parent company, has become chairman of its board. Both executives began careers in research capacities with the company more than 30 years ago. Mr. Diamond will devote much of his time in development of Spar-Mica Corp. Ltd., Montreal, partially owned by Electro Refractories, which he heads as president. He was president of the Grinding Wheel Institute in 1956.

J. Russell Duncan has been elected president and a director, Minneapolis-Moline Co., Minneapolis, succeeding **Henry S. Reddig,** resigned. Mr. Duncan was formerly vice president, Consolidated Foundries & Mfg. Corp., Chicago.

Richard H. Lord, purchasing agent, Grede Foundries, Milwaukee, has been awarded the Milwaukee Junior Chamber of Commerce's Key-Man Award for 1957, for his contributions to betterment of his community.

● **William J. McGraw** has been named general sales manager, **Walter G. Mitchell** general manager of product development, and **Clarence B. Bergren** manager of electric and air tool sales, Thor Power Tool Co. With the company since 1946, Mr. McGraw was a district and branch manager in New York and Cleveland prior to becoming manager of electric tool sales last year. Mr. Mitchell, who will be located in Chicago, has been director-engineering since 1946. Mr. Bergren, until recently Milwaukee branch manager, will be working with Mr. McGraw and other sales executives out of the company's administration offices, Aurora, Ill.

● **William C. Miller** has been appointed sales manager, National precision Casting Corp., Paoli, Pa. He attended Cornell University and was formerly a sales engineer, Beryllium Corp., Reading, Pa.

THOMAS JOHNSON, appointed chief metallurgist, Stainless Foundry & Engineering Inc., Milwaukee, as reported in December.

● **J. D. Harmison,** formerly manager of parts sales, Tractor Group, Allis-Chalmers Mfg. Co., Milwaukee, has been appointed sales manager of its material handling, Buda Div. He joined the Peoria, Ill., branch of the company in 1939, was transferred to the home office in 1951, and became tractor sales manager, Farm Equipment Div., in 1952.

Louis W. Falk, since 1953 vice president-manufacturing, Falk Corp., Milwaukee, has been named executive vice president, succeeding his brother, **Harold F. Falk,** who was elected president in November. Louis Falk attended Cornell University and became associated with the company in 1936, later becoming vice president-engineering.

Irwin Schlosser has been appointed assistant to the president, Central Foundry Co., Newark, N. J. He became vice president in 1953. **John J. Flynn,** since 1950 general sales manager of the company's soil pipe division in Holt, Ala., has been named Central Foundry's vice president-sales.

William R. Magness was recently appointed director of the research and technical department, Luria Bros. & Co., Philadelphia, working out of the New York office. Until recently he was in charge of operation analysis and management research, Battelle Memorial Institute, Columbus, Ohio.

Stanley S. Davies has been elected president, Royer Foundry & Machine Co., Kingston, Pa., succeeding the late S. B. Davies. A graduate of Massachusetts Institute of Technology, the new president joined the company in 1949 as a design-production engineer, becoming general manager two years ago.

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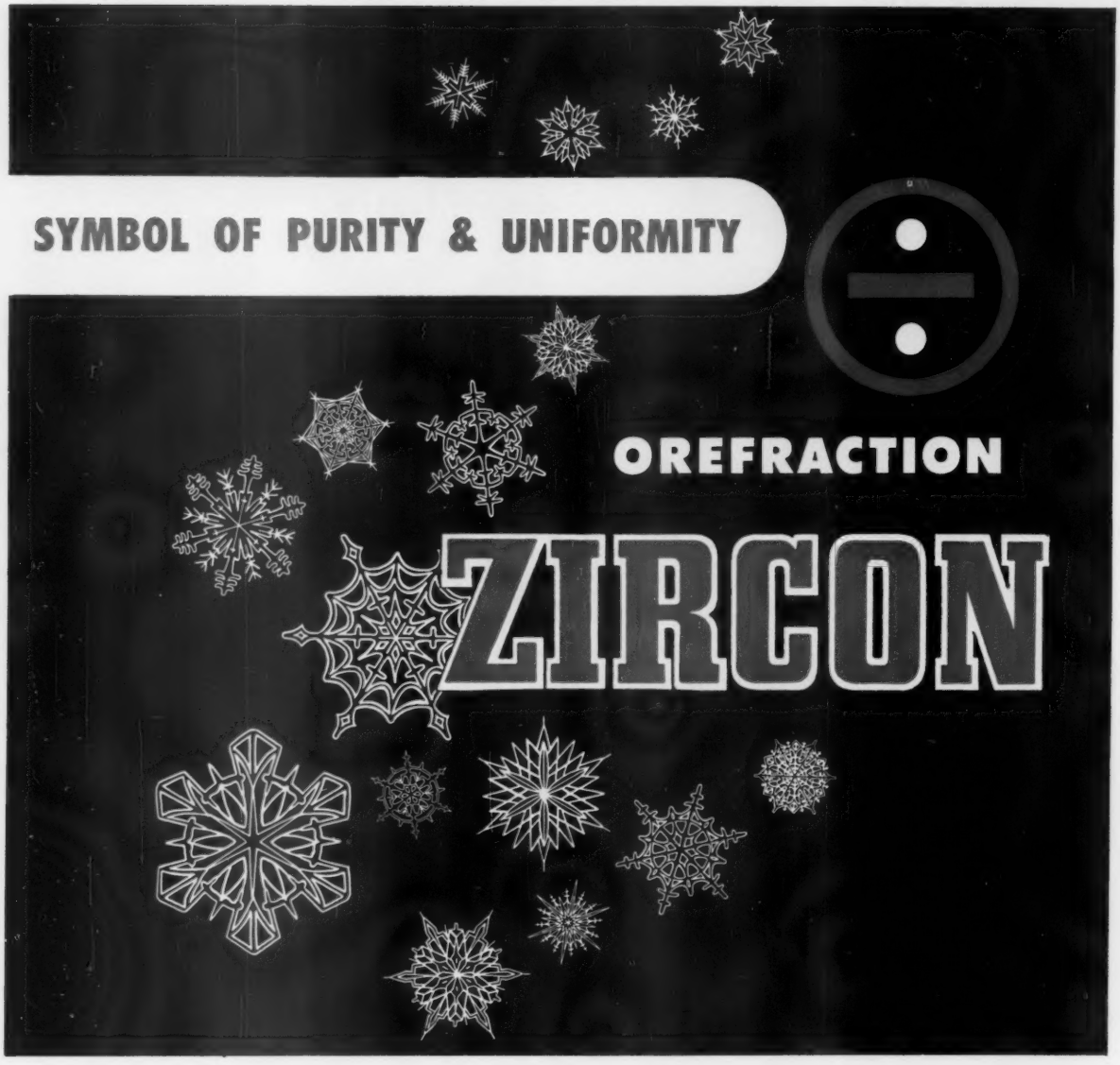

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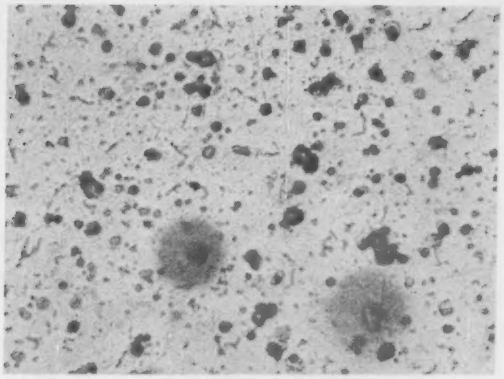


Fig. 1—Autoradiograph shows as-cast nodular iron made with cerium activated in an atomic pile. X75

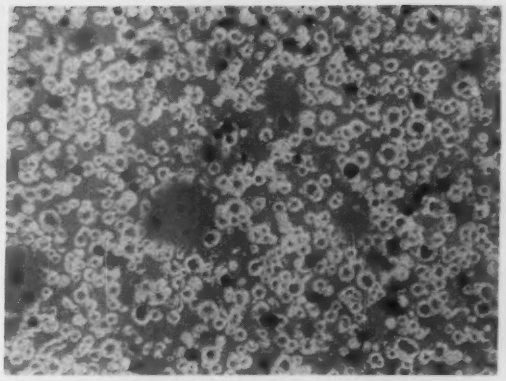


Fig. 2—Autoradiograph also shows nodular iron, but this sample is in the annealed condition. X75

Autoradiography Traces

ADDITIVES IN METALS

By ROBERT H. HERRMANN
Associate Editor

APPLICATIONS of nuclear energy in foundries have been made principally in the field of radioactivity. These applications have involved the use of radioisotopes for radiography, nondestructive testing, gaging, and control.

One of the newer applications of radioactivity involves the use of radioactive elements as tracers to obtain knowledge of materials and processes. Elements in question can be made radioactive and their basic behavior studied with appropriate equipment. The amount of a radioactive element can be determined from the intensity of the radiation, and location of the element in a material can be found by autoradiography.

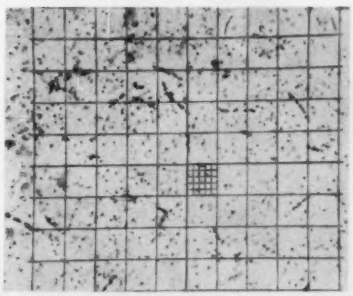
An autoradiograph is a photograph made by a radioactive element contained in a material. The element gives off particles and rays which expose the emulsion on a film or plate placed in direct contact with a surface of the material. Autoradiographs differ from ordinary radiographs in that the latter are obtained by using an independent radioactive source such as cobalt 60, selenium 75, cesium 137, or iridium 192 to radiate through the material or part to a film. With autoradiography the radioactive source is in the material or part being photographed. The method is said to reveal information about materials and processes often unobtainable by other means.

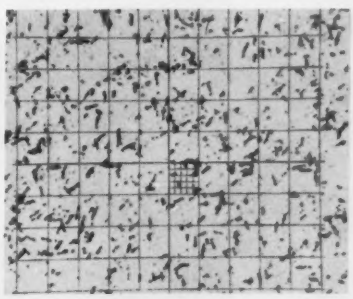
Study Nodular Iron—Ford Motor Co. manufacturing and engineering staff researchers use radioactivated elements to trace distribution of additives in alloys and to study molecular structures of metals. In a recent study, the effects of additives to iron to form nodular iron were studied. Only small amounts of additives are retained in such irons, and autoradiography is one of the few methods available for studying their distribution. Cerium is one of the additives used, and the study was conducted with that element.

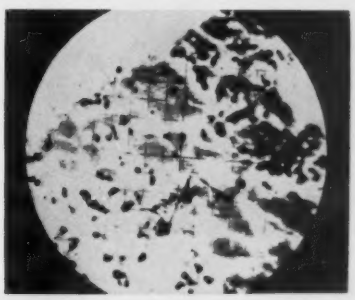
Researchers sent a capsule of cerium to Oak Ridge, Tenn., where it was inserted in a pile for about a week. When returned to Ford the activated cerium was added to a gray iron melt; castings were poured, then sectioned and polished. A photographic emulsion was floated on the polished surface and the casting allowed to stand overnight. Then the emulsion in place on the casting was developed in a solution just as regular photographic films are.

The resultant autoradiograph enlarged 75 times is shown in Fig. 1. It shows the as-cast material. The

Fig. 3—Left, autoradiograph of electrolytic, boron-free iron irradiated in a nuclear reactor. Tracks are due to background radiation. Center, autoradiograph of pile-irradiated steel containing boron. Right, photomicrograph of autoradiograph of alloy with large amount of boron, showing boron segregation



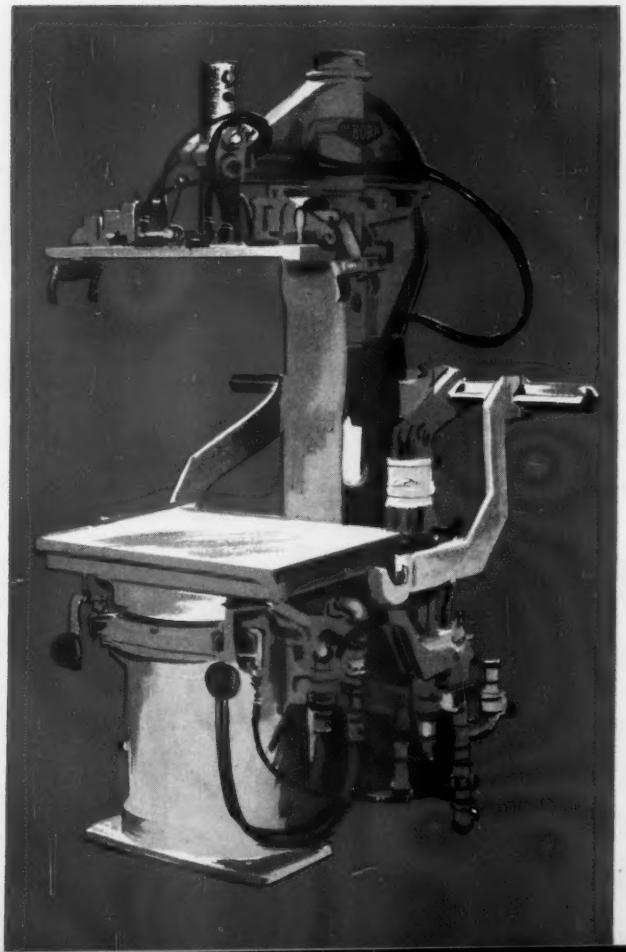




Here's how one man . . .

. . . one **OSBORN ROTA-LIFT®** . . .

can turn your large match-plates into profits!



Here's how the **OSBORN ROTA-LIFT** mechanizes match-plate molding

ROLLOVER *arms are raised—lifting flask on split trunnions for quick, simple operation*

DRAWING COPE *takes place on return stroke of squeeze piston. Pattern plate is vibrated during draw.*

HANDLING COPE *while pattern is manually drawn from drag mold. Left knee valve operates pattern plate vibrator, leaving both hands free for drawing*

CLOSING MOLDS—*cope is swung into closing position and drag raised until it contacts cope. Finished mold is ready for transfer to conveyor or floor.*

Molds formerly considered too large for match-plate molding can be handled on the Osborn Rota-Lift. With the Rota-Lift one man performs *all* the operations that once required two men. But that's not all. Molds are of uniform quality... and there's less operator fatigue to assure more production per man-hour . . . lower cost per mold.

These unique advantages make the Osborn Rota-Lift a profitable investment for any jobbing or semi-production foundry. For full details, write *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Specify OSBORN® leader in mechanization for the foundry

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MOLDING MACHINES • CORE BLOWERS • SHELL MOLDING MACHINES • BRUSHING MACHINES • INDUSTRIAL BRUSHES

Circle 622 on Page 51

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is the only pearlitic malleable shot and grit on the market!

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Forty 50 lb. cartons in one master pack: easy to store, easy to inventory, easy and safe to handle. **No Extra Cost to you.** (Also in conventional 100 lb. or 50 lb. bags.)

FREE
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A free, no-obligation, lab analysis on your blastcleaning efficiency. See where your money goes. **No Cost to you.**

Result? More durable structure, greater resistance to breakdown, longer life, greater cleaning ability, lower abrasive costs, lower maintenance costs, faster cleaning.

®PERMABRASIVE is better than steel shot and grit because it contains more cutting carbides producing a much, much faster cleaning time; add its lower price and you have an obvious savings in costs!

®PERMABRASIVE is better than ordinary annealed shot and grit because it has more cutting carbides and less graphitic carbon—because it has less phosphorus content indicating a resistance to breakdown—and because the cutting carbides are held in a unique ductile matrix; this means a much, much longer abrasive life with an obvious savings in costs!

USERS SAY

"Using (blank) annealed abrasive, the consumption per wheel-hour was 18.4 lbs.; with PERMABRASIVE the consumption was 14.7 lbs. . . . a reduction of 20.1%."

"We checked the performance of PERMABRASIVE vs two brands of Steel Shot. Results:

PERMABRASIVE . . . $.81, Steel Shot—Brand A . . . $1.48, Steel Shot—Brand B . . . $1.04."

"Used PERMABRASIVE in test against mixture of Steel and Annealed Shot. Abrasive cost per wheel-hour with PERMABRASIVE was $.93, against $1.17 for the mixture . . . a savings of 20.5%."

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WRITE DEPARTMENT 9-A.

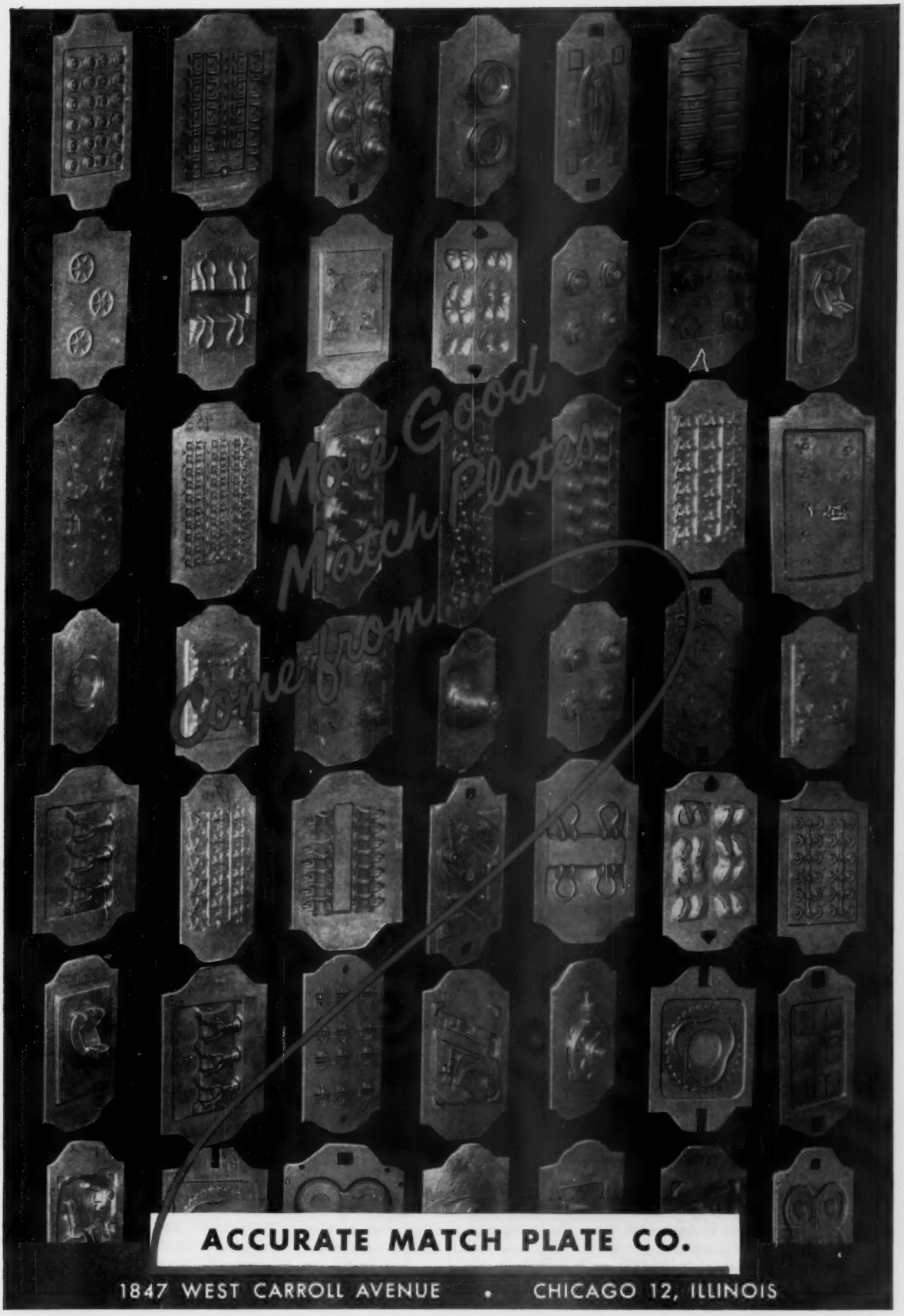
small dark dots are graphite nodules as they appear in a regular polished metallographic sample. The larger, gray circular areas show location of cerium as a result of localized radiation exposure of the photographic emulsion. The cerium is shown to be scattered widely as in a mechanical mixture and not directly associated with the nodules. This type of information contributes additional evidence in the constant search for a clearer understanding of graphite formation. Fig. 2 shows an autoradiograph, enlarged 75 times, of an annealed nodular iron.

Tracing Boron in Steel—Boron has a strong influence on steel properties, partly because of the location of the boron atoms. To study that influence, Ford researchers employed nuclear science. The method used is called neutron activation analysis. It involves a nuclear reaction in which a slow neutron collides with the nucleus of a boron atom and is captured by the boron nucleus with subsequent emission of an alpha particle. The alpha emission is recorded on a special photographic emulsion.

The technique involves placing a photographic film in contact with a flat surface of the metal to be tested. Metal and film are placed in a lead container, which is put into the thermal column of a research type slow neutron reactor. The test must be performed in a reactor because of the short half-life of radioactive boron. Although the container is impervious to gamma rays in the reactor, it transmits neutrons which induce the radioactivity-producing reactions in boron atoms.

Objective of the experiments was to explore the method's usefulness for obtaining information on the amount of boron present in steel and for determining if boron remains in solution homogeneously distributed throughout the crystal lattice of steel, or if there is a tendency to segregate at the grain boundaries. Fig. 3 shows some results of this method of analysis.

Research people at Ford believe that refinements of tracer techniques are necessary before their full capabilities to reveal information are realized. The use of radioactive elements to study metal structure and the action of additives in alloys appears to have high potential value for broadening the understanding of physical phenomena in foundry metallurgy. Practically every element which is a constituent of any alloy can be made radioactive. Thus its behavior in metal can be traced and investigated.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Industry Briefs

ALUMINUM Co. of America has installed a new facility for fundamental study of the diecasting process at its Chicago works. The laboratory will be equipped for full-scale pilot plant operations to permit study under production conditions. It will function as a section of the Cleveland Research Div. of Alcoa Research Laboratories.

Pusey & Jones Corp., Wilmington, Del., has been purchased by a group of businessmen headed by Joseph B. Ulicny, president, John Waldron Corp. The capital stock was acquired from the Aquaterra Co., Wilmington, a holding company. Mr. Ulicny has become president and chief executive officer of Pusey & Jones, which is a 109-year-old firm with annual sales of about $15 million. It employs about 1000 persons.

United States Safety Service Co., Kansas City, Mo., has moved its general office and production facilities to 1535 Walnut St. The move results from a current $5 million expansion program which also involves expansion of research, development, and engineering departments.

Metal Treating Institute reports billings for the first ten months of 1957 totaling $31,450,000, or 0.1 per cent below the $31,493,000 billed in the same period in 1956.

Carborundum Co., Niagara Falls, N. Y., is integrating its Stupakoff Div., Latrobe, Pa., Globar Div., Niagara Falls, and Refractories Div., Perth Amboy, N. J., into one division to be called the Refractories Div. Boyd M. Johnson, Carborundum vice president, is general manager, Robert A. Barr is assistant general manager in charge of sales, and A. L. Leo-Wolf is assistant general manager in charge of operations.

Joseph Dixon Crucible Co., Jersey City, N. J., recently marked its 130th anniversary. The firm began in 1827 in Salem, Mass., in a single-story shack with a handful of employees. Today, the company's Jersey City structure spreads over four blocks and is headquarters for six branch plants, two of them outside the United States. The firm produces more than 3000 different industrial products, almost all of them graphite-based.

Kwik-Mix Co., Port Washington, Wis., a subsidiary of Koehring Co., has appointed two new distributors. Industrial & Foundry Supply Co., 2500 Union St., Oakland, Calif., has been assigned that portion of California lying north of and including Fresno, Monterey, and Mono Counties. Malcolm G. Stevens, 78 Summer St., Arlington 74, Mass., will handle the New England area.

Bay State Abrasive Products Co., Westboro, Mass., is planning a new and larger district office and warehouse in Cleveland, an abrasive grain crushing and processing plant in Westboro, a grinding wheel manufacturing plant in California, a coated abrasive manufacturing plant in Westboro, and a complete grinding wheel manufacturing plant in Italy. Previous expansion projects have cost nearly $4 million during the last two years.

White Machine Works, Eau Claire, Wis., has undertaken a $3/4 million expansion program which will include doubling its foundry facilities. The new foundry will provide increased production facilities for piston ring castings, small machine-molded gray iron castings, and large centrifugal castings.

Big D Foundry & Pattern Co. has begun production of magnesium and aluminum castings in a new plant at 4731 Algiers, Dallas, Tex. Initial employment is 20, and plans call for an expansion of the work force to about 200 within a year. Joe Cohen is president.

Gries Reproducer Corp., New Rochelle, N. Y., producer of miniature diecastings, is expanding its plant and production facilities to more than double output. The expanded plant will contain over 150,000 sq ft of space. Completion of the new facilities is scheduled for early spring of 1958.

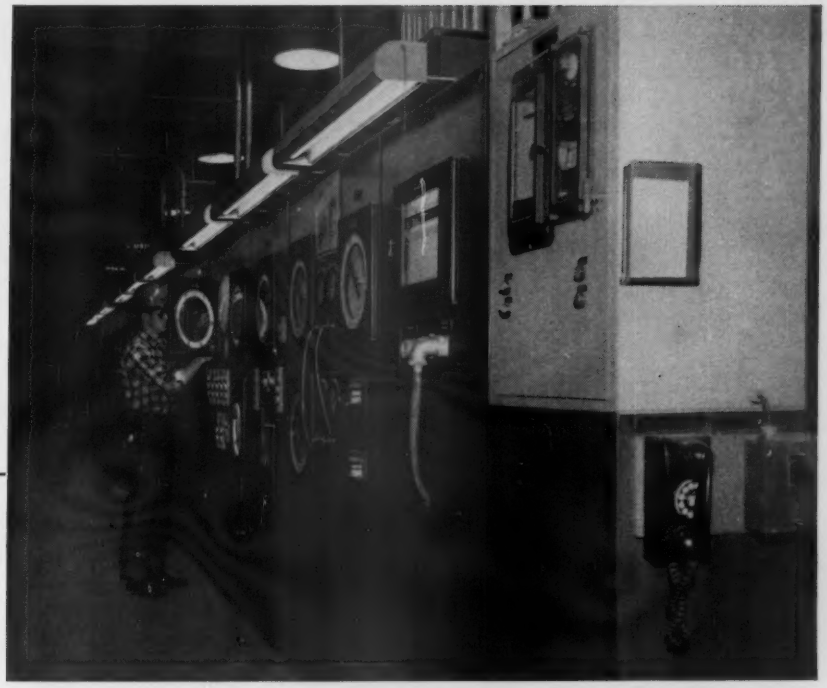
Waukesha Motor Co., Waukesha, Wis., has purchased the plant and assets of Climax Engine & Pump Mfg. Co., Clinton, Iowa. Both firms make engines, and the Climax foundry will produce iron castings for the combined line.

Gold Coast Foundry, 721 NW Eighth Ave., Ft. Lauderdale, Fla., has been purchased from Gold Coast Industries by Luther J. Evans, a former Chicago businessman who will operate the company.

Esco Ltd.'s new alloy steel foundry in Port Coquitlam, B. C., Canada, now is in production, making castings ranging in weight from ½ to 5000 lb. Most are of an abrasion and shock-resistant type.

Gardner-Denver Co. and **Dresser Industries Inc.** have terminated merger negotiations. Inability to agree on management structure is said to have been responsible for the breakoff in talks.

MORE MALLEABLE IRON: Pennsylvania Malleable Iron Corp. has begun operations at this new foundry in Landisville, Pa., which duplicates facilities of the company's main plant in Lancaster, Pa. The company also operates a third plant, its Hardware Division, in Lancaster. The new facility, a one-story structure, contains approximately 35,000 sq ft and is designed so that additional units can be added to provide for any future production needs. It is equipped for production of malleable iron castings up to 25 lb in weight



One of three cupola control panels contains *ElectroniK* controllers for two cupolas and a heat exchanger.

Honeywell controls aid in production of 3500 engine castings a day at new engine foundry

The new foundry of one of America's leading auto manufacturers has set a fast pace in the production of 6 and 8-cylinder engine castings.

In three phases of foundry operation—sand drying, core drying and cupola operation—Honeywell recording and controlling instruments help keep production humming.

This modern instrumentation complements the most up-to-date equipment for fast handling of materials. Overhead and floor conveyors speed movement of cores, molds and castings. Molten iron from cupolas is transferred in ladles carried in electrically-driven, cab-type cranes suspended from overhead monorails.

Here, as in many other types of foundry operation, Honeywell instrumentation pays for itself in terms of production, efficiency and quality. Your nearby Honeywell field engineer can help you gain these benefits in your own plant. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

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Circle 657 on Page 51

SFSA ISSUES RAW MATERIAL SPECIFICATIONS

Foundries Provided Standards for First Time

TENTATIVE specifications covering three raw materials used in the foundry industry have been issued by the Steel Founders' Society of America. They apply to gelatinized cereal binder, zircon sand and flour, and western bentonite.

This is the first time that foundrymen have been provided a guide covering required properties of certain raw materials which they purchase. Although the Steel Founders' Society is the sole source of these specifications, they apply to the properties rather than the use of the materials; consequently it is expected that they will prove equally as beneficial to other types of foundries as to steel foundries.

Specifications applying to other materials will be available this year. The first three to be issued, prepared by the society's Specifications Committee and reviewed by the material producers, will be in effect for two years. If not revised in that time, they will be advanced to standard. Copies are available only from the society at 606 Terminal Tower, Cleveland 13, Ohio, at 25 cents each. Suggestions for revisions in the tentative specifications should be sent to the same address.

Gelatinized Cereal Binder, SFSA Designation 10T-57. Among the technical requirements included in this specification are the following: Moisture content—4 to 10 per cent; soluble material—either 5 to 15 per cent or 16 to 30 per cent; pH value—4.5 to 7.0; ash content—1.5 per cent maximum. Containers, which are to hold a maximum of 105 pounds, are to be marked to indicate whether the cereal binder is in the heavy-weight, medium-weight, or light-weight classification.

The specification also includes acceptance tests for the determination of moisture content, percentage of dry substance, pH value, and ash content.

Zircon Sand and Flour, SFSA Designation 11T. Among the requirements of this specification is that the material be free of oils or acids, both of which are harmful in foundry practice. The following chemical composition is specified: ZrO_2 65 per cent minimum; TiO_2 0.35 per cent maximum; Fe_2O_3 0.40 per cent maximum; combined silica 34 per cent approximately; free SiO_2 1.00 per cent maximum. Screen classifications are given for three recommended grades of zircon sand and three of zircon flour. Testing procedures are given for the determination of specified properties.

Western Bentonite, SFSA Designation 13T. The specification applying to western bentonite sets limits on such properties as moisture content, pH value, calcium oxide content, and liquid limit value. This specification, which involves the use of newly developed liquid limit test equipment, will be described in more detail in a subsequent issue.

Additional material specifications now are in course of preparation by the Steel Founders' Society's committee, which is headed by R. H. Frank, Bonney-Floyd Co., Columbus, Ohio. Other committee members are Paul H. Stuff, Ross-Meehan Foundries, Chattanooga, Tenn.; V. E. Zang, Unitcast Corp., Toledo, Ohio; A. F. Gross, Ohio Steel Foundry Co., Springfield, Ohio; C. W. Briggs, Steel Founders' Society, Cleveland.

Appoints Ingot Distributors

Kaiser Aluminum & Chemical Sales Inc. has appointed Aaron Ferer & Sons Inc., 2300 E. Eleventh St., Los Angeles, Calif., to distribute ingot. Alloys & Chemicals Mfg. Co., Cleveland, has been appointed Detroit area distributor of standard alloy ingot. The distributor's Detroit office is at 1554 Buhl Building.

HOW TO DO IT

Casting Round Aluminum Stock for Use in Foundry Experimental Work

By H. J. GERBER
Assistant Professor
Oklahoma Agricultural & Mechanical College
Stillwater, Okla.

EXPERIMENTAL and prototype work often requires the use of a small amount of round aluminum stock in a variety of diameters. Since maintaining a large stock of sizes in that material is impossible we follow the practice of casting it as needed.

A piece of seamless steel tubing, similar to that shown at right in the illustration, is set on end in a bed of molding sand and poured full of molten metal. Upon cooling, the aluminum will contract enough to allow it to be bumped out of this permanent mold easily.

The aluminum slugs, left in the illustration, are smooth and accurate and usually are sound and free from porosity. They may be held in a lathe chuck for machining. Sometimes we saw them into blanks much the same as would be done with regular drawn round stock.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

How to upgrade your iron without changing furnace practice

Small additions of molybdenum, made right in the ladle, are the most practical way to add strength and toughness to gray cast iron. A good rule of thumb to follow is: 50 points of moly=7000 psi tensile strength.

There's no need to interfere with your regular cupola operation when a job calls for high strength iron. Simple-to-make moly additions in the ladle provide needed strength, without any sacrifice in toughness. In fact, moly increases toughness at least as much as strength.

Moly helps, too, in obtaining uniform response to heat treatment, and in producing machinable, growth-resistant castings.

Remember: Moly additions upgrade your iron—with no change in the character of the charge, normal melting practice, or the base metal. For more information on why moly makes better cast iron, write for the series of bulletins "Why Moly Iron". Climax Molybdenum, Dept. 20, 500 Fifth Avenue, New York 36, N. Y.

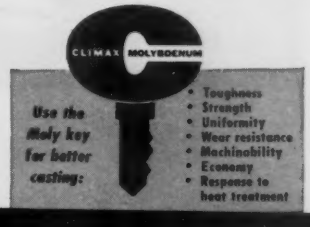
MOLY MEANS STRENGTH

0.25% Mo will increase tensile strength by about 3500 to 4000 psi
0.50% Mo will increase tensile strength by about 7000 to 7500 psi
0.75% Mo will increase tensile strength by about 10500 to 11000 psi
1.00% Mo will increase tensile strength by about 14000 to 15000 psi

Section size 1.2 in. dia.

CLIMAX MOLYBDENUM

Circle 625 on Page 51



Members of the T & O Committee at the annual conference of the Steel Founders' Society of America. Front row: R. A. Gezelius, R. O. Tibbals, I. M. Emery (chairman), Paul von Colditz, W. W. Heimberger. Second row: C. W. Briggs, N. B. Grace, A. P. Guidi, N. V. Davi, R. J. Sherlock, and H. A. Conyne

Steel Founders Hold 12th Annual

Technical and Operating Conference

TWELFTH annual Technical and Operating Conference of the Steel Founders' Society of America attracted a total attendance of 562, including 528 representatives from 123 foundries. The meeting was held at Hotel Carter, Cleveland, Nov. 11-13.

Forty men participated in the preparation and delivery of thirty papers covering subjects related to foundry research and operating practice. Authors and speakers other than those from member companies of the society included C. E. Sims, Battelle Memorial Institute; G. L. Gorbell, Monsanto Chemical Co.; H. F. Bishop, Exomet Inc.; H. F. Taylor and Guy Powell, Massachusetts Institute of Technology, and P. J. Ahearn, Watertown Arsenal.

Featuring the program was the first exchange lecture between the Steel Founders' Society of America and the British Steel Castings Research Association. The lecture discussed the carbon rod resistor furnace in steelmaking and use of the dip thermocouple technique in British foundry practice. It was presented by T. A. Cosh, head of steelmaking

Presentation of the society's Diploma of Honor on occasion of the first exchange lecture with the British Steel Castings Research Association. Left to right are I. M. Emery, T & O Committee chairman; L. W. Sanders, Lake & Elliot Ltd.; T. A. Cosh of the British association; H. F. Park Jr., SFSA president, and Charles W. Briggs, technical and research director

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during the entire mixing cycle- AND...

ADD PROFITS!

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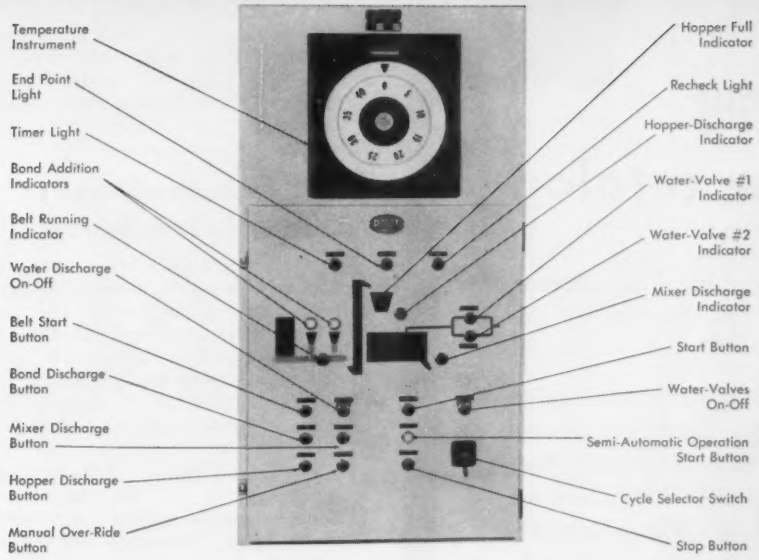

Unit illustrated is No. 3917 Combination Automatic End Point Moisture Controller and Automull.

The No. 3907 Dietert-Detroit End Point Automatic Moisture Controller . . . highly accurate and quality engineered along traditional Dietert lines . . . automatically regulates the addition of water to sand in a mixer, to produce tempered sand with any desired moisture content.

1. Continuous "recheck" throughout the mixing cycle protects against moisture loss and guarantees maximum accuracy.
2. Base water is added rapidly and blended in over the full cycle. Physical properties of every batch are fully developed.
3. End point is reached slowly to prevent overshooting and assure accuracy.
4. Sand is automatically discharged when correct moisture is stabilized. Cool batches that contain nearly tempered sand are quickly cycled through the mixer. Tonnage is increased and handling costs reduced.
5. Highest quality components minimize maintenance.
6. Constant batch size not necessary.
7. No moving parts in mixer.
8. Single dial controls swift, easy changes in the moisture level and handles a number of different sands.
9. Sealed, plug-in relays and delay timers assure fast, simple maintenance.
10. Cabinet is dust-proof NEMA type 12.
11. Includes remote panel box with sequence indicator lights and control switches.

MAXIMUM **molds per man**

KEEPS PRODUCTION **MOVING** No Costly Interruptions

REDUCES CASTING LOSSES LOWERS CLEANING COSTS

SCRAP RATIO SLASHED TO A MINIMUM

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Quotes you Complete with every accessory you need! NO HIDDEN EXTRAS!

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140 illustrations

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section, British Steel Castings Research Association, and L. W. Sanders, chief metallurgist, Lake & Elliot Ltd., Braintree, Essex, England.

One session was devoted to a panel discussion of problems submitted by various companies. Members of the problem-solving panel were Francis H. Hohn, Scullin Steel Co.; F. E. Kurtz, Electric Steel Castings Co.; P. J. Neff, American Steel Foundries; E. B. Nutter, Alloy Steel & Metals Co.; J. H. Sander, Tonawanda Electric Steel Casting Corp., and Paul H. Stuff, Ross-Meehan Foundries.

The conference program was arranged by the society's T & O Committee under the chairmanship of I. M. Emery, Massillon Steel Casting Co. Other committee members are G. W. Heck Jr., Birdsboro Steel Foundry & Machine Co.; N. B. Grace, Symington-Gould Corp.; A. P. Guidi, Texas Foundries Inc.; R. J. Sherlock, Union Steel Castings Div., Blaw-Knox Co.; C. B. Williams, Massillon Steel Casting Co.; W. W. Heimberger, Buckeye Steel Castings Co.; C. E. Stull, Pelton Steel Casting Co.; R. O. Tibbals, American Steel Foundries; N. V. Davi, Pacific Steel Casting Co.; H. A. Conyne, Pacific Car & Foundry Co., and R. A. Gezelius, General Steel Castings Corp.

1958 International Foundry Congress To Be in Belgium

The International Committee of Foundry Technical Associations has entrusted organization of the 25th International Foundry Congress to the Association Technique de Fonderie, the Belgian foundry group. The meeting will be held in Brussels and Liege, Belgium, from Sept. 29 to Oct. 3, 1958.

Preliminary plans call for the official opening of the congress in Brussels and for technical sessions to be in Liege. Features will include visits to Belgian plants and laboratories and to the concurrent International Exhibition. The human aspect of foundry problems will be one of the major topics of the congress.

Coremaking and Coreblowing Are Features of New Film

Various types of coremaking and coreblowing operations in use in ten outstanding U. S. foundries are covered in a film, "Mechanization in Coremaking," available for showing through courtesy of Beardsley & Piper, division of Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39, Ill. The film is 16 mm, black and white, sound, and has a running time of 40 minutes.

Beach wear by Jantzen

Does everything a good steel shot will do, *except* cost so much! Yes, "SEMI-STEEL" abrasives have steel shot characteristics, but sell at *malleable prices.* If you have been paying high prices for steel shot, change to "SEMI-STEEL" and save!

METAL BLAST, INC.

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Circle 629 on Page 51

PROPER USE OF CORES

Can Improve Casting Production

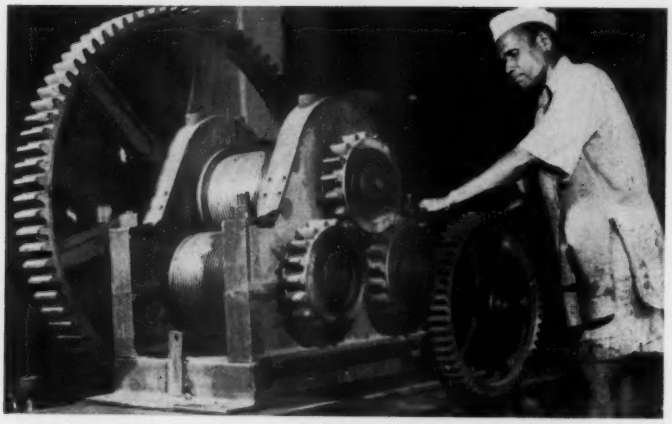

Fig. 1—Gears for this sugar cane crusher are made faster and easier through the use of cores

By C. A. PHALNIKAR
Chief Metallurgist
Kirloskar Brothers Ltd.
Kirloskarvadi, India

SOMETIMES it is considered uneconomical to use cores in casting because of their cost. The designer therefore often tries to minimize use of cores as much as possible.

Many times, however, this practice requires intricate patterns which necessitate high skill and excess manhours in molding. Actually, in some instances, proper application of cores simplifies molding headaches and improves production. This article will cite some examples.

Gear Castings—At Kirloskar Brothers Ltd., Kirloskarvadi, India, sugar cane crushers of various sizes have been manufactured for 20 years. Castings for the crushers are made in

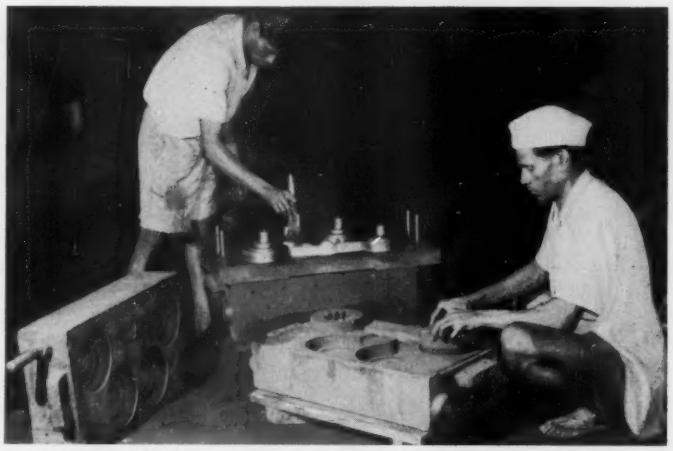

Fig. 2—In matchplate method of molding gear castings, molder is setting cores in the drag

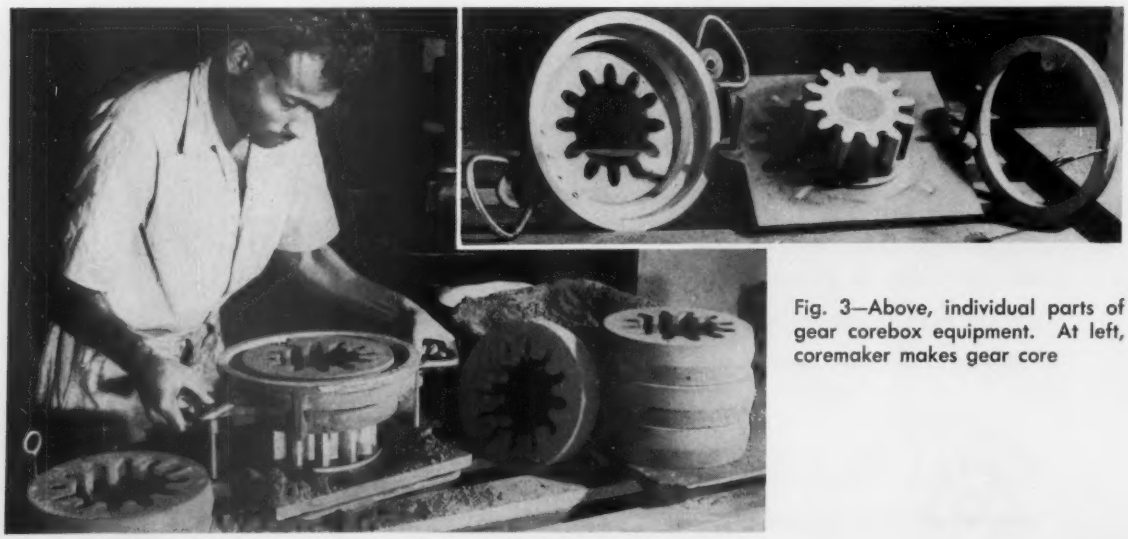

Fig. 3—Above, individual parts of gear corebox equipment. At left, coremaker makes gear core

These six foundries are saving a total of $29,700 a month, every month, with National Sand Recovery Systems

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FOUNDRY	A	B	C	D	E	F
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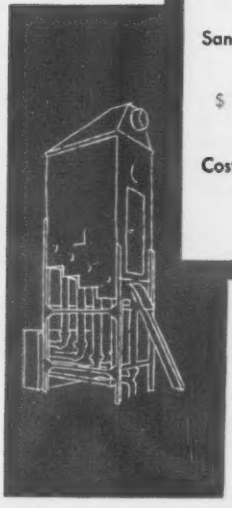
Cost of Reclamation (-)	0.52/T	0.44/T	1.13/T*	0.49/T	0.69/T	0.67/T
Savings on Sand	$ 9.57/T	$7.14/T	$6.37/T	$5.01/T	$5.10/T	$6.33/T
Sand used per month (x)	1000/T	600/T	1000/T	600/T	600/T	720/T
$ Savings per month	$9570	$4284	$6370	$3006	$3060	$4558
Cost of installation Amortized (projected)	3-4 mo.	11-12 mo.	7-8 mo.	11-12 mo.	6-7 mo.	9-10 mo.

*User operates two units.



These figures represent actual dollar savings realized by six average foundries who are now operating the National Sand Recovery System. To them we would like to add these statements, selected at random from letters received from far sighted foundrymen who are now operating over 30 National Sand Recovery units throughout the country:

"The simplicity of operation, compactness of installation, extremely low maintenance cost, easy disposal of refuse material, and the inherent cleanliness attached to this type of unit, in our opinion, all tend to make such a unit indispensable to the modern foundry."

"We have been continually producing castings using all-reclaimed sand with results equal to that of all-new sand. Operator cost for reclaiming has been nil—under one-half of one manhour per eight hour shift."

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Circle 630 on Page 51

TABLE I—Casting Production by Various Methods

Molding Method	Manhours	Number of Castings	Average % Rejected	Manhours per Good Casting
Single metallic pattern	8	8	15-18	1.33
Hand molding machine	16	24	20-22	0.75
Core method	24	120	2-5	0.21

the company's gray iron foundry. With increased demand for these products, necessary improvements are being made in the foundry to supply the required number of castings. One development is production of the gear castings by the use of cores. To appreciate the advantages of this technique, the original casting methods and their problems must be compared with results of the new technique.

An assembled sugar cane crusher with gears produced by the core process is shown in Fig. 1. The smallest pinion gear is 4½ in. in diam and has 12 teeth (pitch diam is 3). The original gear pattern was made single, of gray iron. Teeth were cut on a gear-cutting machine with the usual taper allowance.

Flanges on both sides of the gear required that the molding operation be done in three fixed flasks. Flanges were molded in the bottom and top flasks, and the tooth portion was formed in the middle flask. The casting was poured in green sand, and the metal entered the mold through a vertical gate on a tooth. The center hole was made by a round core.

Permeability of facing sand was 70 to 90, and the green compression strength 7 to 9 psi. Careful, uniform hand ramming around the teeth was essential to reproduce the correct size and shape of the teeth. Loose ramming caused the teeth to swell, and hard ramming created blowholes. Sand frequently burned out around the teeth, and rejects caused by loose sand occurred. These difficulties seriously hindered production of the gear castings.

Improvement resulted from use of a stripper-type molding machine. The two gray iron patterns were mounted on a plate which was fixed on the machine, and snap flasks were substituted for the fixed flasks. The molding operation was much simplified, but the difficulties inherent in the former method were not eliminated completely. Swelling of the teeth, blowhole defects and loose sand rejects continued.

Moreover, the distance between the two flanges varied if the lever stops did not operate properly because of molding sand sticking in the machine. Such a variation in the distance between the two flanges caused difficulty in meshing one pinion into another in the final assembly operation. Production results were far better than with the previous method, but not quite satisfactory.

Recently, the core process has been developed to produce these gear castings. Four round gray iron patterns for the smallest pinion gear are mounted on one gray iron plate (Fig. 2). Because of the symmetrical design of the patterns, the flanges are molded in cope and drag from the same matchplate, in green sand. Two fixed gray iron flasks are used. Molten metal enters the mold through an aluminum gate in the drag.

The tooth portion of the gear is formed in a separate corebox, and the coremaking operation (Fig. 3) is simple. The gun metal tooth portion is fixed on a plate, and the round aluminum corebox with the stripping arrangement is placed on the plate. The inside depth of this piece equals that of the matchplate pattern, and this half-portion of the core sits in the cope. The other half-core is formed by placing another loose aluminum ring, which sits in the drag.

To this aluminum ring, gates are attached on both sides of the gear. The taper in the two halves of the corebox is in the opposite direction. After the core box has been assembled, a linseed oil sand mixture is rammed uniformly around the teeth and the other parts. Excess sand is struck off, and the loose aluminum ring is lifted. Then the corebox is removed with the core and set on the working bench.

A flat plate is placed on the core covering area, and the whole as-

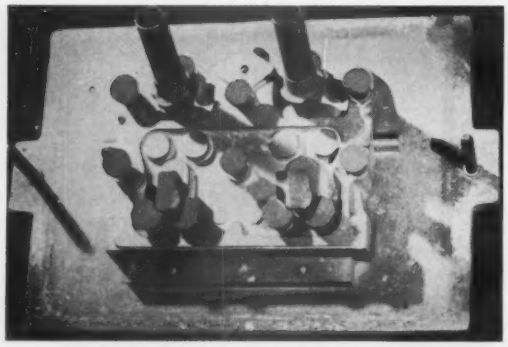


Fig. 4 — Ram-up cores are inserted in pattern for an 18-hp cylinder head casting to facilitate ramming

Fig. 5 (below)—Illustration shows variety of inserted ram-up cores in half-mold

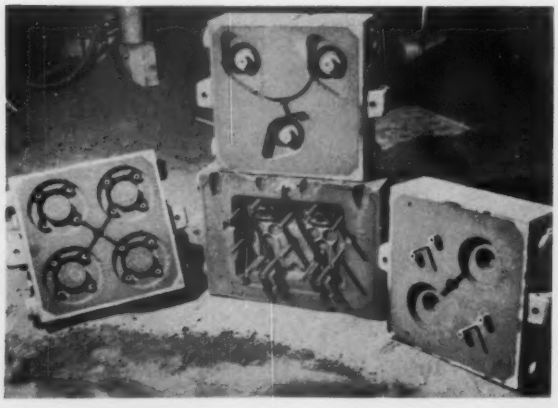
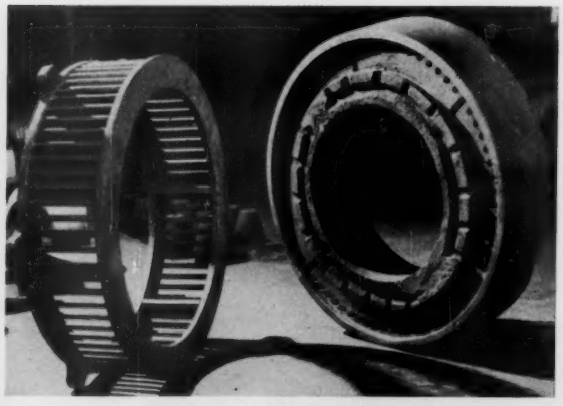


Fig. 6—Right, hardened core for 16-in. strainer casting. Left, the casting itself



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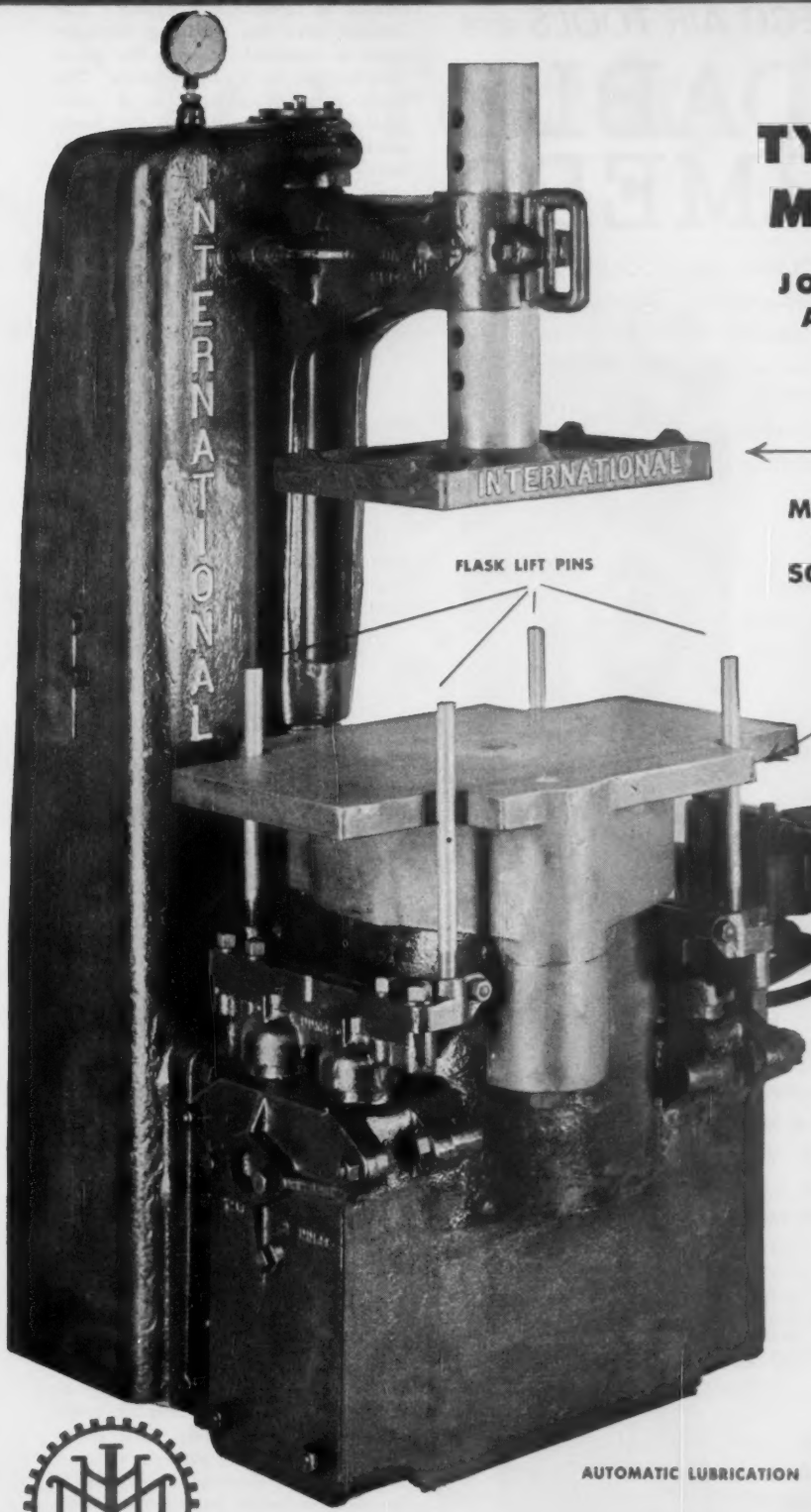

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sembly is turned over lightly. The corebox with the stripping arrangement is removed, leaving the green core for the teeth on the plate. The green core is hardened in a coke-fired oven overnight, and the hardened core is used in the mold next day. During the baking process, the shape and the size of the teeth are not distorted.

This process has eliminated the swelling, blowhole defects and loose sand rejects encountered with the previous methods. It has effected great improvement in the production of the castings, as can be seen by studying the data presented in Table I. This core method also is employed to produce other gear castings, of similar design.

Ram-Up Cores—Many castings require round, cored holes from ⅜ to 1½ in. in diam. These cores generally are made on a hand-operated, plunger-type core machine. The round vertical prints on the pattern serve to set the cores accurately in the mold.

Repeated use of the pattern causes the prints to become loose, and straight cored holes in the casting are obtained with difficulty. When the casting requires too many cored holes of different sizes, proper ramming of the pattern becomes a nuisance. Considerable molding time is lost in setting and replacing the prints before and after the completion of the mold. As the cores are set in the drag, loose sand often results from uneven contact of the cores in the cope. In addition, the pattern storekeeper has to keep a correct inventory of numerous core prints—for patterns of many sizes.

In our foundry, these difficulties have been solved by the use of ram-up cores. Aluminum coreboxes are made for cores of different lengths and diameters, and those desired are obtained from hand blowing machines. Average production of such cores is approximately 600 to 800 per machine per 8-hr shift.

Cores are set directly into the pattern before the mold is rammed. A collar is provided for the round portion of the core to facilitate holding the core rigidly in the molding sand.

Since cores are set rigidly in place while the mold is prepared, the possibility of obtaining off-center holes is eliminated completely. An 18-hp cylinder-head casting pattern is shown in Fig. 4 to illustrate how easily the pattern could be rammed with ram-up cores. This method certainly offers advantages in matchplate production work. Time is saved in setting and replacing prints and cores prior to and after completion of the mold. Moreover, the cores also can be set in the cope easily, thus elimi-

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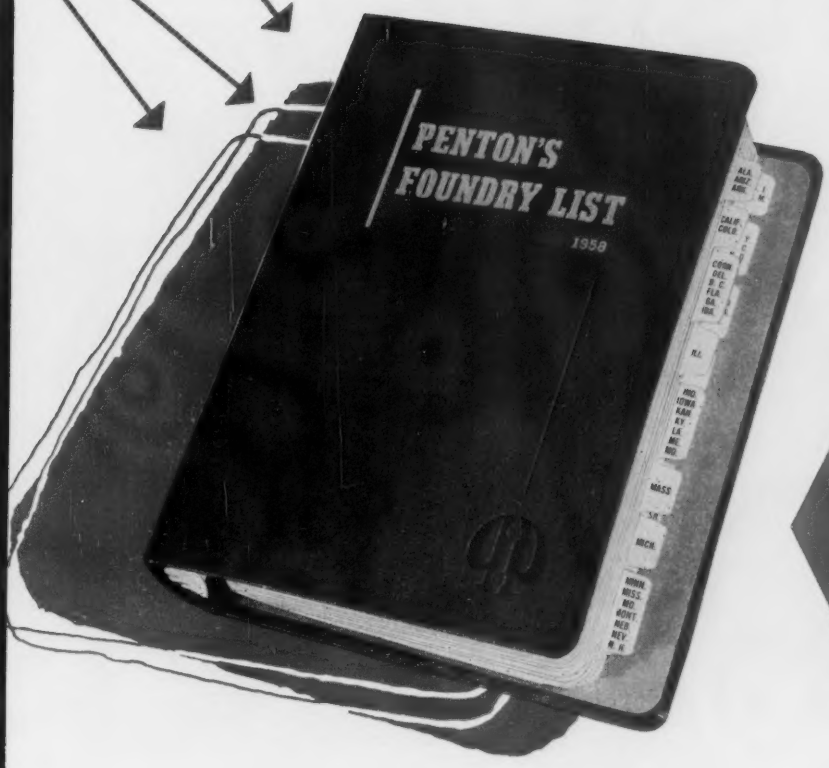

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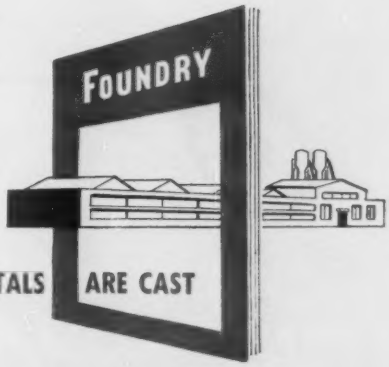

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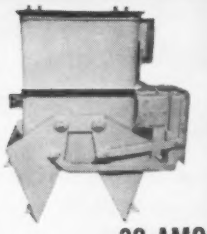

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1-A

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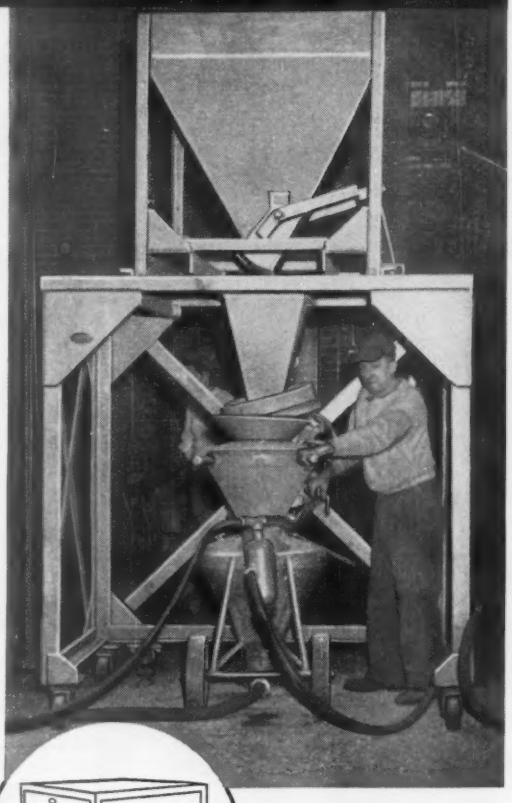

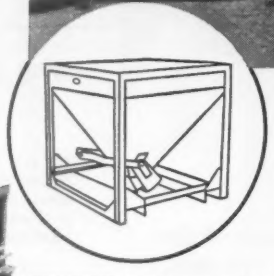

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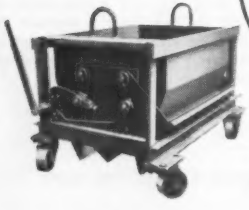

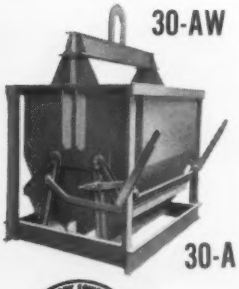

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nating the possibility of loose sand.

The use of ram-up cores is not limited to round, straight cores. Other shapes also can be used, as shown in Fig. 5.

Strainer Castings—Kirloskar Brothers produces foot valves in sizes from 1 to 16 in. Foot valve castings are made in green sand except for sizes from 8 in. up. The presence of thin ribs on the strainer castings of heavy foot valves requires considerable molding time and often causes loose sand rejects. Recently, some molding manhours have been saved and loose sand rejects cut by preparing the molds by the CO_2 hardening process.

The 16-in. strainer casting is made by the core process. An aluminum corebox is utilized to mold the bottom flange and ribs in a one-piece core (Fig. 6). The vertical ribs are produced in the core by the insertion of loose prints in the corebox. The hardened core is placed in the floor sand, and a gray iron, flat flask is used as the cope in which the top flange is formed. Two gates are cut in the bottom flange. This method has realized considerable savings in the cost of the casting.

Acknowledgment — The author wishes to express his gratitude to Kirloskar Brothers Ltd. for granting permission to publish this material and to A. K. Phalnikar, works manager, and B. V. Deshpande, pattern designer, for their help.

Competition for Metallurgical Scholarship Award Is Open

Carnegie Institute of Technology has announced the fourth annual competition for the Leo F. Reinartz Freshman Scholarship. The $700 award is made each year to a high school senior for study in the Department of Metallurgical Engineering of Carnegie's College of Engineering & Science.

Mr. Reinartz is a Carnegie alumnus who has retired recently as vice president, Armco Steel Corp., Middletown, Ohio. Scholarship funds are provided by the National Open Hearth Steel committee of the American Institute of Mining, Metallurgical and Petroleum Engineers in recognition of Mr. Reinartz' contributions to the work of the committee.

Scholarship and admission information may be obtained by writing to the Chairman of Admissions, Carnegie Institute of Technology, Pittsburgh 13, Pa. Applications must be made by Jan. 15, 1958, for entrance in the freshman class of September, 1958.

Circle 634 on Page 51

Circle 635 on Page 51→

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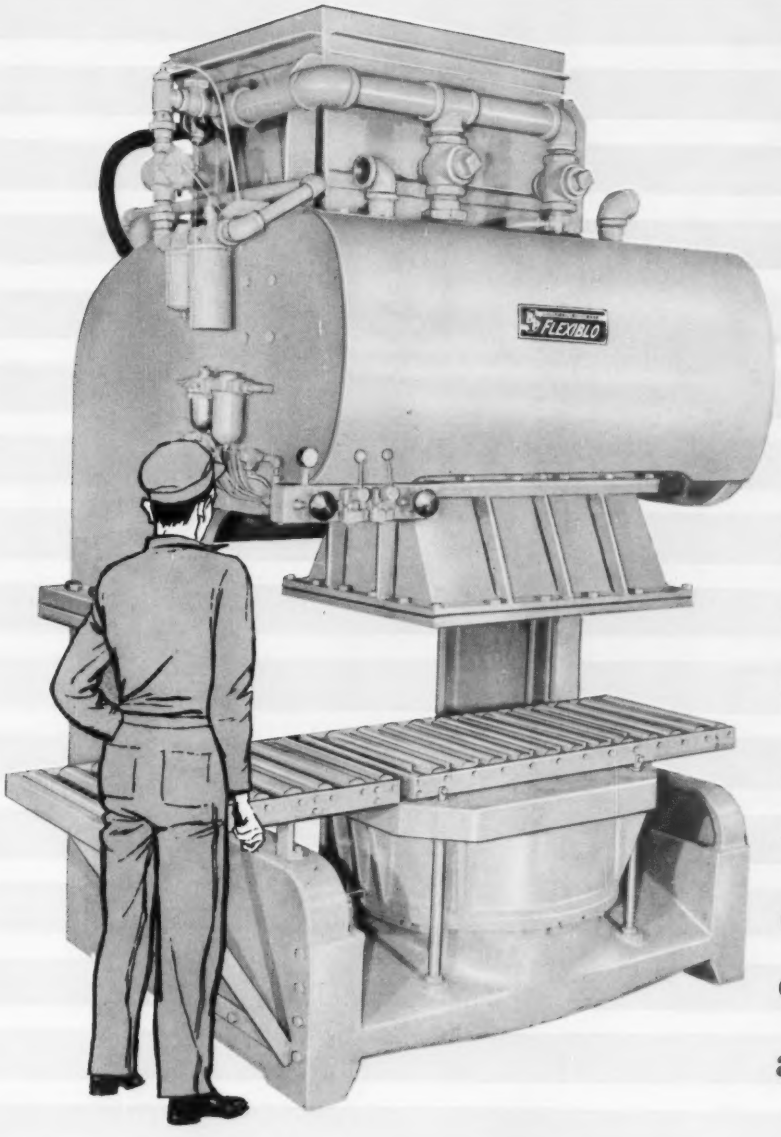

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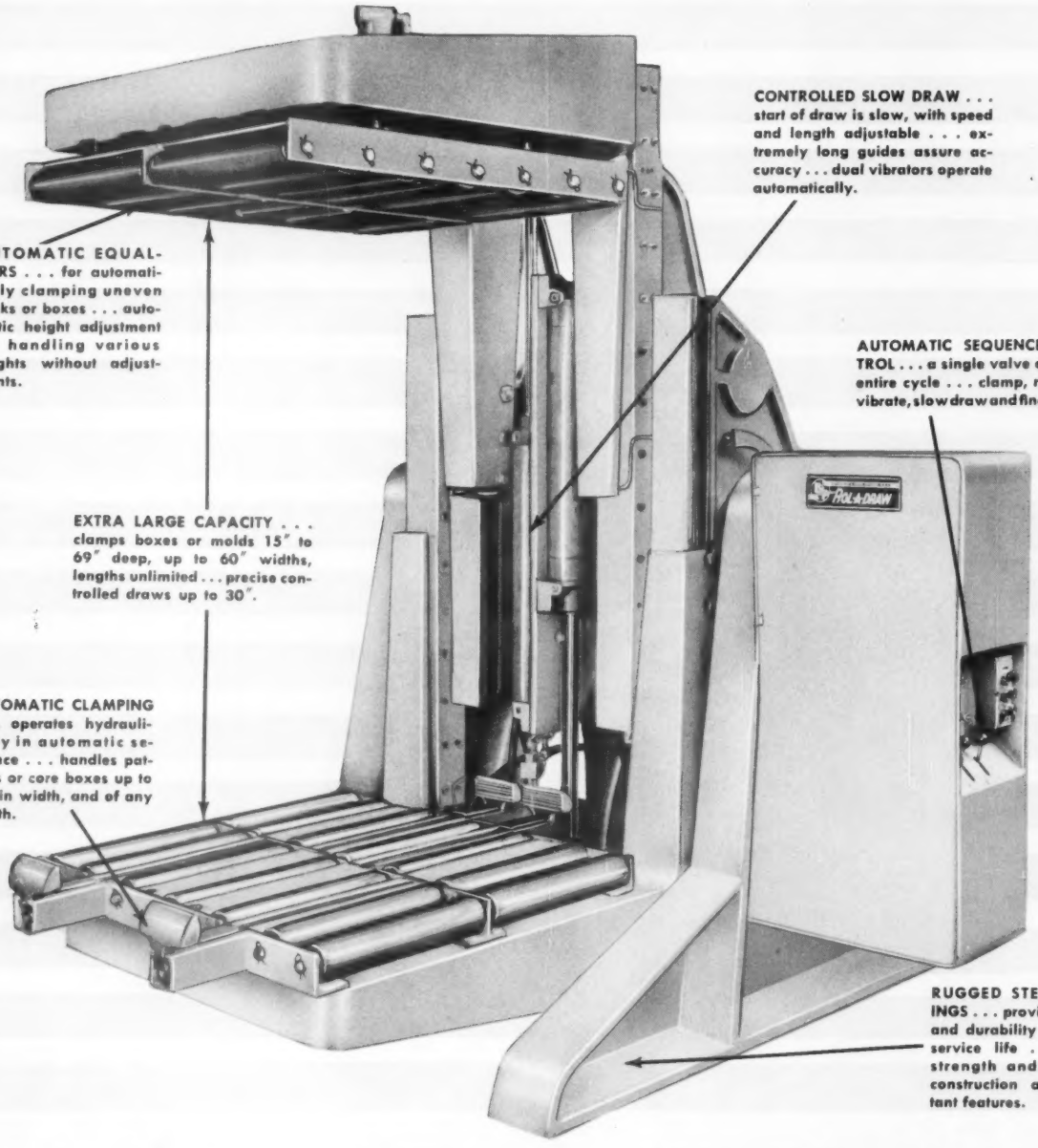
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Foundry Developments

By EDWIN BREMER
Metallurgical Editor

INVESTIGATION by Sidney Low and co-workers on the research and technical control staff, Chapman Valve Mfg. Co., Indian Orchard, Mass., indicates that suitably weld-repaired steel castings and monolithic structures weld-fabricated from cast steel components will serve just as satisfactorily as sound, unwelded castings in nuclear power applications. Details of the scope of the investigation and the data obtained were given in a paper presented at the Fall meeting of the American Society of Mechanical Engineers.

Specimens from 650-lb cylindrical castings of austenitic stainless and carbon steel in welded and unwelded condition were subjected to short-time elevated temperature tensile and smooth-bar creep-rupture tests. Thermal shock tests on weld-fabricated cast steel bottles also were conducted.

Eliminates Guessing

REDUCTION in quench-cracking in steel is reported to be accomplished by an electronic instrument developed at Watertown Arsenal. Instrument signals when the steel part has hardened sufficiently, and then the part is withdrawn from the quench to be cooled slowly to minimize development of internal stresses and consequent cracking. Instrument is expected to eliminate errors caused by variations in steel composition, fluctuations in temperature, agitation and composition of quenching bath, variations in furnace temperature and time of transfer from furnace to quench, and variations in thickness and character of oxide scale. Information is available in report PB 131111, "An Electronic Signaller To Reduce Quench-cracking of Steel," by L. D. Jaffe, D. C. Buffum, and I. L. Preble, obtainable from Office of Technical Services, Washington 25, for $1.

Reveals Age

BRIEF item in *Foundry Trade Journal* (London, England) mentions in connection with cores made by the CO_2 process, a procedure for insuring the use of the oldest cores first. Method is simple, involving use of a colored dye added to the silicate. In the foundry a different dye is used each week, but it is pointed out that the same system could be applied to differentiate between daily production.

Resists Cavitation

ACCOMPANYING illustration shows one of ten stainless steel blades for two Kaplan hydroelectric turbine units. The blade, weighing about 3500 lb, was cast at the Buffalo foundry of Allegheny Ludlum Steel Corp., for S. Morgan Smith Co., hydraulic turbine maker. The turbine

units will be installed at the Camargos dam in Brazil, and it is expected that the stainless steel blades will provide resistance to corrosion and cavitation pitting attack by the water. Kaplan turbines have adjustable blades to permit deriving more power from streams where wide variations in flow and head exist.

Geometry Has Effect

COMPARISON of tensile properties determined from separately cast test bars and from specimens from various locations in plate, L, T, and X shaped castings of different thicknesses made of the 195 and 356 aluminum alloys in the T-6 condition resulted in the authors' drawing the following conclusions:

1. The 356 alloy castings are characterized by relative uniformity of properties throughout. Average tensile strengths are 100 to 80 per cent of separately cast test bar strengths as section thickness is increased from ¼ to 2 in. Average elongation values of specimens removed from castings of each thickness are about 30 per cent of separately cast test bar values. Elongation values in light sections and strength values in heavy sections can be improved by utilizing special foundry techniques.

2. The 195 alloy is relatively sensitive to cooling rates, and properties vary markedly. Average tensile strengths in ¼-in. sections exceed those of separately cast bars by about 20 per cent, while those in 2-in. sections are approximately 20 per cent below. Average elongation values of specimens from castings made with routine foundry practices decrease from 80 to 30 per cent of separately cast bars with section size changes of ¼ to 2 in. Relationships may be improved by use of special foundry techniques.

Complete details on the castings studied and the foundry practices employed are presented in Report PB 121227, "Effect of Geometry on the Properties of 195-T6 and 356-T6 Aluminum Alloy Castings" by Johnson and Bishop and available from the Office of Technical Services, Department of Commerce, Washington 25, for 50 cents.

Saves Time

CONSIDERABLE reduction in coremaking time is described in an article, "Metallurgical Factors Affecting Locomotive Castings," by W. Montgomery in the October issue of *The British Foundryman* (Manchester, England). Binder for the cores is an air-setting type composed of 70 per cent by volume boiled linseed oil and 30 per cent tung oil. About 2 per cent by weight of the mixed oil is added to the sand with the addition of 0.2 per cent of dryers consisting of 40 parts by volume of 3 per cent cobalt type and 60 parts 10 per cent lead type dryer.

At temperatures of 60 to 70° F the mix will set in the corebox in about 50 minutes. With addition of 0.2 per cent of an oxidizing agent such as perborate or peroxide the setting time is reduced to 20 minutes. Baking time is only a fraction of that required for conventional oil bonds, and for certain cores may be eliminated.

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"Of one thing I am sure: As important as financial security is to a happy and useful old age, it's not the only answer to the problem"

Retiring for the Road Ahead

SOME time ago, it occurred to me that over a period of 10 or 12 years, an increasing number of my friends had been bringing up the subject of retirement—in terms either of getting ready for it or of their experiences and reactions after they had begun it. Looking back over what these folks had to say on the subject, I realized that their feelings about the matter varied all over the lot.

Some, I remembered, were greatly excited about retirement and looked forward to the day as one toward which they had worked ever since their birth. Some said they thought they were going to like the idea, but so far hadn't got around to making any plans. Others—and some with ample nest eggs—seemed to be right up against a stone wall as to what in the name of Heaven they were going to do with themselves. Another group, much smaller than one would suspect, was scared stiff with fear as to what might happen to them and their loved ones once the umbilical cord of the pay check finally was cut.

As I compared the date of my birth with the current calendar and noticed an increasing number of other unmistakable signs and symptoms, it dawned on me why I was being singled out as an audience for all those retirement tales. I found that it wouldn't be long before I too would join the ranks, with tales of my own to tell.

While I faced up to this situation, a phrase popped into my head which to me was rather exciting—"re-tiring for the road ahead." Although I never did have much patience with puns or clever twists of words, this phrase seemed to turn the subject of retirement around, back end to, away from its most common meaning of getting out of traffic and off the road entirely. Instead, it implied more carefully selected trips on the same road, but at a much more comfortable pace and toward new or long neglected points of interest.

The Idea Took—I liked the idea of changing tires for the road ahead so much that I began to make plans accordingly and to use the analogy in my preparations. I began to reason something like this: The age or model of my vehicle, including its top speed, is perfectly obvious to almost anyone, including myself. Although I never did go in much for trying to keep up with the Joneses, I'll have to admit—to myself, that is—that I have had unguarded moments when I wore myself all out with close shaves trying to show one of the Jones boys that there was a lot of stuff in the old jalopy yet. On the other hand, I had to admit that there were many more times when, after ambling along at my own comfortable speed, I pulled up at the traffic light right behind the Joneses, in spite of their much later model.

Then it occurred to me that from what I have seen over the long haul, competition is a much more highly rated means of attaining any worthwhile end than it deserves to be. I decided that what tiny remnant of competition remained in me had to be got rid of as a vital step toward retirement. The high-pressure racing tire would be much too hard for my personal comfort on the road ahead.

Chinese work for the day when they are free to contemplate nature

I also decided to travel light from there on out so that I could use softer tires. Something happened about this time to clinch this decision. Mrs. Lee, my son Ralph, and I were pulling out of our driveway one day, dragging a rented house trailer loaded down with everything we would need for Ralph's two-week fishing trip.

Barely out of the driveway, I stopped and looked back at the house, whereupon Mother asked, "What's the matter, Daddy? Did we forget something?"

"Nothing I can think of," I answered, "But, Mother, it just struck me that if we have everything we need to live comfortably for two weeks stowed away in this little trailer, what in the name of Heaven is that big structure back there filled with?"

Mother didn't have an answer, but the question stayed with us. In fact, it was responsible for our getting rid of the white elephant as a means of lightening the load for the road ahead. Ten years before I retired, we built a much smaller house and trimmed our expenses and responsibilities accordingly.

A Gradual Process—I guess that what this all adds up to is that retirement is something we've got to creep up on as age creeps up on

Circle 659 on Page 51→

Save by using specialized refractories

Many refractories problems in metal-working furnaces have been solved *economically* by the use of B&W specialized refractory castables. Each ferrous or non-ferrous furnace application requires a specific combination of properties to meet the service conditions. Whether your problem is high temperatures, abrasion and erosion, slag attack or the need for insulation, to name a few, you will find the refractory castable best suited to your requirements in B&W's line. Shown here in digest form are data on the widely used B&W refractory castables for metal-working furnaces:

B&W Refractory Castables for Metal Working Furnaces

	Temp. F	PROPERTIES	TYPICAL APPLICATIONS
B&W Kaocast	3000	High resistance to spalling and slag attack. Low volume change and negligible reheat shrinkage.	Soaking pit covers, linings of high temperature heating and forging furnaces, burner blocks, electrode linings of electric furnace roofs, linings of non-ferrous metal furnaces.
B&W Kaocrete 32	3200	High strength, exceptional refractoriness, unusual volume stability, excellent resistance to spalling.	Can be used in applications similar to those of B&W Kaocast and where higher refractoriness is required.
B&W Kaocrete D	2500	Sufficient strength and hardness to withstand abrasion, considerable physical abuse and erosion.	Aluminum melting furnaces, linings and car tops in heat treating furnaces, as well as in sections of a wide variety of furnaces that are subject to scraping by hand tools or other mechanical abuse.
B&W Kaocrete A	2600	Resists reducing atmospheres. Has good resistance to erosion, abrasion and thermal shock.	Annealing furnace bases and other applications where resistance to reducing atmospheres is essential. Also as a general purpose castable for linings in medium temperature service.
B&W Kaocrete B	2300	Has an adhesive plastic texture particularly suited for vertical or overhanging constructions. Excellent for plastering.	Patching linings and baffles and for any application where plastering rather than gunning or casting is required.
B&W Kaocrete LI	2700	High alumina content, exceptionally high strength for resistance to abrasion and erosion.	Aluminum furnace linings where high alumina content is important.
B&W Kaolite 20	2000	Offers castable's fast, low cost installation plus insulation. Has refractoriness, light weight and low heat conductivity and, in addition, will resist reducing atmospheres. Can be poured or gunned.	Aluminum melting, heating and heat-treating, annealing and forge furnaces. Also for general maintenance and patching.
B&W Kaolite 22	2200	Has the same properties as B&W Kaolite 20. Can be used for higher temperatures but not in reducing atmospheres.	

Send for your copy of B&W Bulletin R-35. It gives additional information on B&W's versatile refractory castables.

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Circle 637 on Page 51

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Circle 638 on Page 51

us. We can't dive into it as you would into a swimming pool. It would be better to take swimming lessons first or maybe serve an apprenticeship. At least that's the way it seems to me.

Of one thing I'm doubly sure: As important as financial security is to a happy and useful old age, it's not the only answer by a long shot. Of all the miserable specimens I ever have seen, the worst are the well housed, well fed, idle souls rocking themselves to death without a solitary thing to do.

Among the outstandingly successful retirees in my collection are those who made only a meager wage, but learned, in their early days, how to live within their means of time, talent, opportunity, and money—folks who didn't just squeak through, but grew old gracefully, with security every step of the way, influential among their associates, active in their church and civic affairs . . . real persons.

Another bit of fact against competition. Isn't it amazing what little it takes to live wholesomely, helpfully, and effectively? Mrs. Lee suggested that we might tuck in here something she read some place: "Spending money we can't afford for things we don't want to impress people we don't like."

"Unless a man can find in his work not only a means of earning a living, but also a reason for living, he really isn't alive." And we don't have to look very far into any of the many kinds of work we have learned to do without finding a real reason for living. I hope you will forgive me for platitudinizing you who have had as much and more experience than I have had, but I have a childlike belief, or let's say feeling, that God put us all here on this earth for a very special purpose, even though it might seem that we find ourselves engaged upon a circumstantial or happenstance basis. He performs His miracles in mysterious ways.

The Over-all Plan—But I am convinced that each of us was created as a necessary means for the fullfillment of the Creator's over-all plans. The realization that this is so, it seems to me, breaks the chains of slaves working only to make a living and gives us a reason for living worthy of all the pain, sweat, and struggle it involves.

In this light, our work is never finished. There still remain questions about our work unanswered, the joy of searching out the answers and making them available to young people just starting out.

A while ago, I read of a brilliant Chinese student attending one of our

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To meet the growing demands of foundries which need a good mold and core wash well suited to the carbon dioxide mold-core hardening process—The United States Graphite Company has pioneered and developed MEXICAN® VV Flake ("volatile vehicle"). This new mold and core wash comes in paste form and is completely compatible with isopropyl alcohol, oleum spirits, kerosene, or similar agents. Mixed with isopropyl alcohol as its thinner, it can be easily "lit off" to promote faster drying. Suitable for application by spraying or dipping, MEXICAN VV Flake provides excellent protection and peel for molds and cores . . . bringing to foundries which utilize the CO_2 technique, a new high in production and casting quality; and greater refractory protection for molds and cores. Use of MEXICAN VV Flake with isopropyl alcohol improves the skin hardness and allows molds and cores to be stored for longer periods of time without deteriorating. Comes in 55 gallon drums.

for further information on MEXICAN VV Flake or other quality MEXICAN products, write: 235

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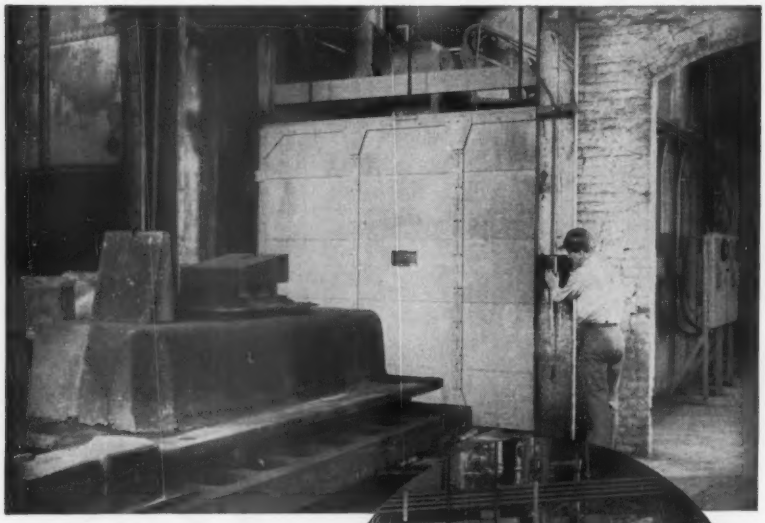

CAR TYPE CORE AND MOLD OVEN

Above—A difficult engineering and installation problem solved by Carl Mayer because the oven filled this space completely. This modern oven, with patented down draft heating system and motor operated lift door, replaced an obsolete brick oven.

RACK TYPE CORE OVEN

Right—Installed at rear of mold oven to form an efficient, flexible combination. Miscellaneous cores are uniformly baked with modern, automatic controls. Operation is efficient and economical.

Carl Mayer's outstanding engineering and design features sold the steel mill where these ovens are now in operation. They incorporate the exclusive Carl Mayer recirculating heating system and special triple slotted panel construction.

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universities who had won outstanding academic honors in his particular field. Someone asked him what he intended to become. He replied that his greatest ambition was to follow in the footsteps of his father. "What is your father?" he was asked.

"He is a student," the young man replied.

"A student!" his questioner asked in amazement. "But how has he managed to earn a living and send you to college?"

"Where I come from," the young man explained, "it is of course the accepted duty of all men to learn a trade, a craft, or a profession with which to earn the wherewithal to bring up a family, but only as a means of arriving at the day when they will be free to study the classics of art and music; to contemplate the wonders and beauties of nature; to look at flowers unhurriedly, to smell them and to arrange them to the best possible advantage; to express one's self with pen or brush, with clay, metal, or wood; to seek answers to the puzzling questions which have accumulated over the lifetime.

"Some time ago," he concluded, "my father turned over his business to my elder brothers. In my country making money is only a means, never an end in itself."

It begins to look to me as though retirement is only a myth. In fact, one of these days I'm afraid I'll be forced to retire from retirement. There are so many things to do that need being done, so many things to learn to do and to learn to know.

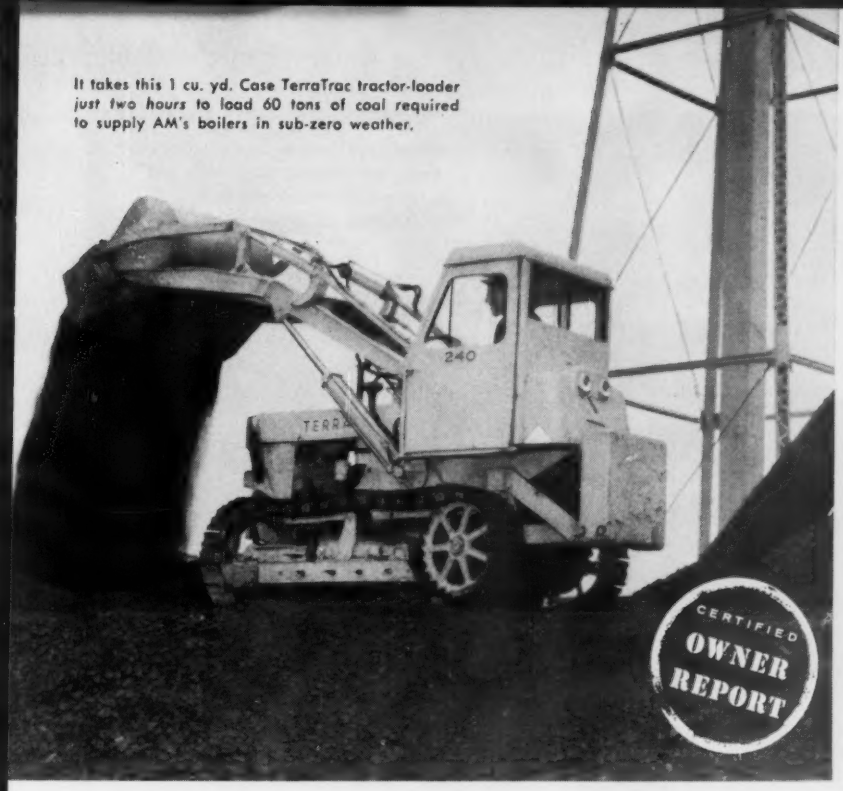
Mounted Wheel, Disc Standards Are Issued by Association

American Standards Association has approved a standard on Machine Mounting Specifications for Abrasive Discs and Plate Mounted Wheels, B5.35. Material covered includes location and size of bolt holes in steel disc wheels and the mounting side of abrasive discs and plate-mounted wheels.

Definitions and standard sizes are listed for abrasive discs in the inserted nut, inserted washer, tapped mounting plate types, projecting stud type, and cylindrical type. Plate-mounted wheels also are covered.

Typical illustrations which show the various classes of discs together with the hole size for each size also are listed.

Copies of the standard are available by writing to the Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio.



It takes this 1 cu. yd. Case TerraTrac tractor-loader *just two hours* to load 60 tons of coal required to supply AM's boilers in sub-zero weather.

Low-cost tractor-loader pays dividends at American Motors

Over a year ago, the Automotive Parts Division of American Motors Corp., Milwaukee, decided they needed an *inexpensive general-purpose rig* to load coal for their power house. Machine also was needed to remove ashes, handle sand and gravel for concrete maintenance, do rough grading and clean-up — *plus* handling snow removal in winter. After witnessing *demonstrations of five competitive tractors,* Management purchased a 1 cu. yd. Case® TerraTrac® Model 600 tractor-loader, equipped with torque-converter drive and hydraulic power-shift Terramatic transmission.

Handles all coal loading

Primary job of the TerraTrac is loading coal from stockpile to outside hopper, where it is picked up by conveyor and delivered to power house. Maneuvering along a 3′ coal ramp, with a loading cycle of 10′ to 100′, this high-speed crawler loads an average of *30 tons of coal per hour,* to keep boilers supplied with fuel.

Performs handyman chores

During spare time, versatile TerraTrac carries sand and gravel from stockpile to portable mixer, so concrete repairs can be performed *on-the-spot,* without need for truck or extra hand labor. It also carries out ashes . . . handles *plant-wide* clean-up, truck loading, grading . . . and during winter, removes snow from *three* parking lots for over 500 cars.

Warehouse Mgr. Lund says:

"We think our TerraTrac was a wise investment. It's ideal in size, has excellent maneuverability, and has proved *completely adequate for every job required of it.*" Why not investigate the economy of Case TerraTrac crawler-loaders — in capacities from ⅝ to 2 cu. yds. — for your operations. *Easy monthly terms or LEASE plans to fit your needs.*

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INDUSTRIAL WHEEL and CRAWLER
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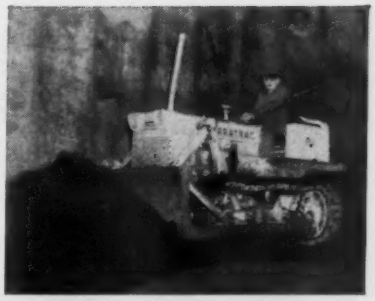

"Best method we've found for unloading coal-boats"

To simplify getting full payloads of coal out of ship compartments, a large coal consumer uses this highly maneuverable 62 HP Case TerraTrac Model 600 bulldozer, equipped with *rubber track pads* — to push hard-to-reach coal away from bulkheads and under hatches, for efficient clean-out by clam bucket.

Sure-footed crawler traction, combined with *exclusive* torque-converter drive, provide the *extra push* needed to move big loads effectively on *slippery steel surfaces.* Company also reports that TerraTrac's *exclusive* hydraulic power-shift transmission and power-turn steering enable operators to *maneuver faster, easier in cramped holds of ships* — without clutching or stopping to shift gears. Six sizes — 42 to 100 HP. Want more facts?

For extra economy in light loading and clean-up

You'll also want to investigate the money-saving advantages of this ruggedly-built 42 HP Case Model 320 *rubber-tired* industrial loader. Equipped with ½ *cu. yd.* capacity self-leveling bucket, it's available through Case Industrial Dealers for *less than*

$3200 FOB Factory (plus freight and taxes). Grader blade, power steering and 8-speed shuttle transmission optional at extra cost.

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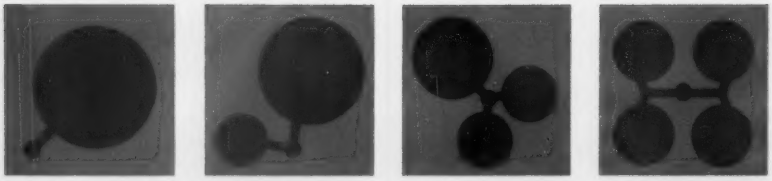
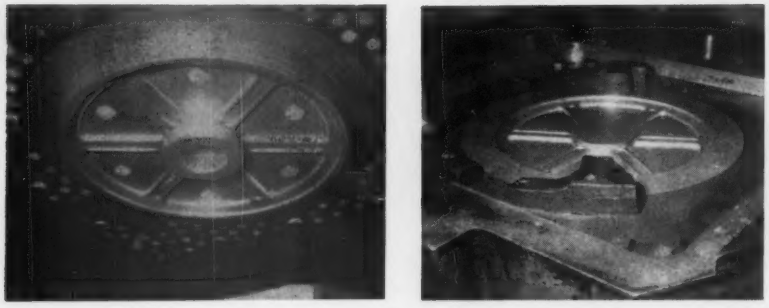
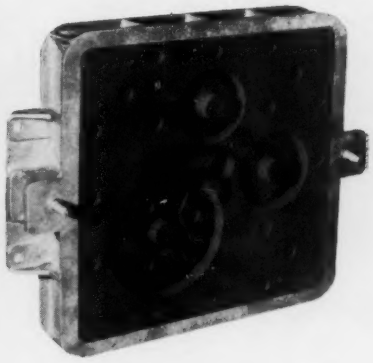


Left—Loose inserts covering the range of sheave sizes are set in standard-size openings in pattern plates as shown



Drag pattern with blow and vent holes is mounted against machine blow-plate as shown at left. The cope pattern is shown in place at right



Drag face of a completed mold shows three-cavity arrangement

Making Sheaves by

STACK MOLDING

By ROBERT H. HERRMANN
Associate Editor

ELECTRON CORP., Littleton, Colo., was started by Frank L. Tettemer in March, 1937, as Animating Products Inc. The name was changed to Jewelite Corp. in October, 1938, and in 1941 its name was changed to Electron Corp. Its major product was fluorescent lighting fixtures.

During World War II the company grew five times its original size and was eager to use its expanded facilities and experience in the postwar market. Market research indicated the existence of a strong market for sheaves to transmit power through V-belts. To make good sheaves, good machine tools are needed. So the company installed a modern machine shop.

Then to insure itself a steady supply of uniformly high quality sheave castings, Electron bought a gray iron foundry. It soon proved to be too small, and in 1948 a new building was constructed and equipped with modern machinery, including an automatic muller, overhead sand handling system supplying 16 molding machines and one sandslinger, mechanical mold dumping and shakeout, ventilation facilities and conveyor movement of castings to cleaning and sand back to storage. Gray iron and nodular iron are produced in two cupolas and inoculated in the ladles to obtain the desired analysis. Blast air to the cupolas is weighed and the humidity controlled. Foundry capacity is 1500 tons a month with nearly 150 production workers.

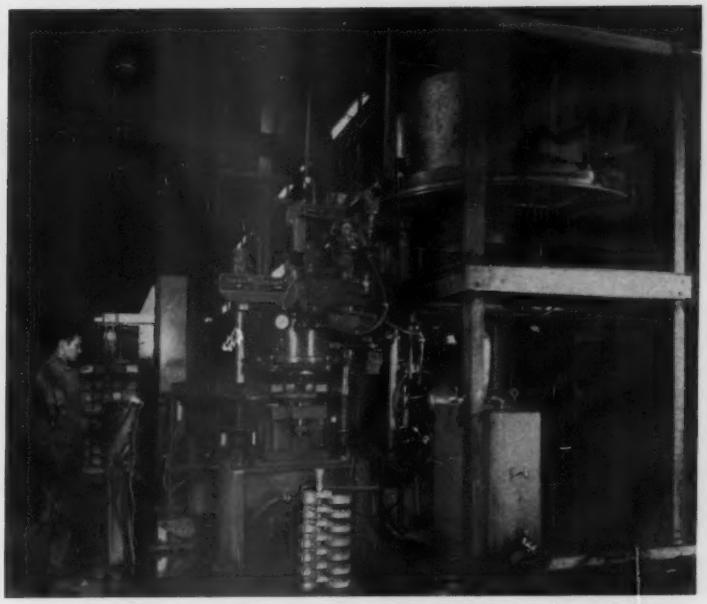
Stock sheaves are produced in sizes from 2-in. pitch diameter with one groove to 50-in. pitch diameter and twelve grooves. Sheaves up to 8-ft pitch diameter with as many grooves as needed have been produced on special order.

Look for New Methods—Since competition is strong in the sheave business, company management continually is on the lookout for ways to reduce production cost and maintain or improve quality. If sheaves can be cast to closer tolerances and if weights of sheaves in a given size can be kept within a narrow range, time spent in balancing and machining can be reduced with a consequent saving in cost. With this idea in mind, management recently began investigating various methods of making and assembling green sand molds.

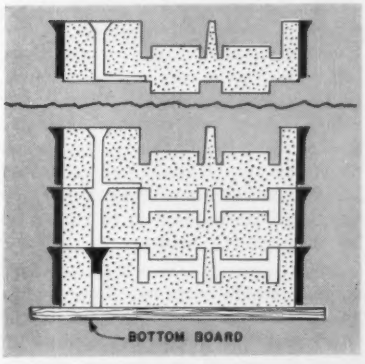
After considering the pros and cons of several methods the company decided to use stack molding, and, because it fulfilled its needs, the machine chosen was an automatic cycling, blow-squeeze unit equipped with a three-station turntable, which indexes every 20 seconds. Stacks consist of eight sections, making available seven mold cavities. Thus fewer mold sections are required than would be needed with cope and drag work to produce the same number of salable castings. Fewer units are involved in clamping or jacketing, weight placing, pouring, and shakeout.

Flasks used are 18 x 18 x 4 in. high. They are annealed to relieve stresses. Also their volume capacity is kept nearly constant, resulting in uniform mold density and hardness and closer fidelity of mold to pattern. The result is that stack mold sections have accurately aligned mold cavities and sprue holes and parallel top and bottom surfaces required for the stacking operation. Seventy-six

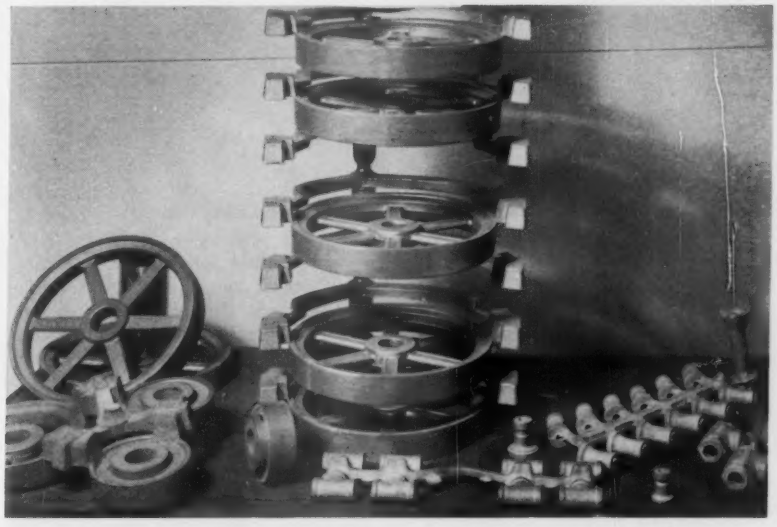
Stack molds, heavily weighted, are poured on a gravity roller conveyor



Side view of the molding installation shows operator at control panel. A stack of sheaves with gating intact is in foreground



Schematic drawing portrays the stack of mold sections, showing sand gap between the flasks



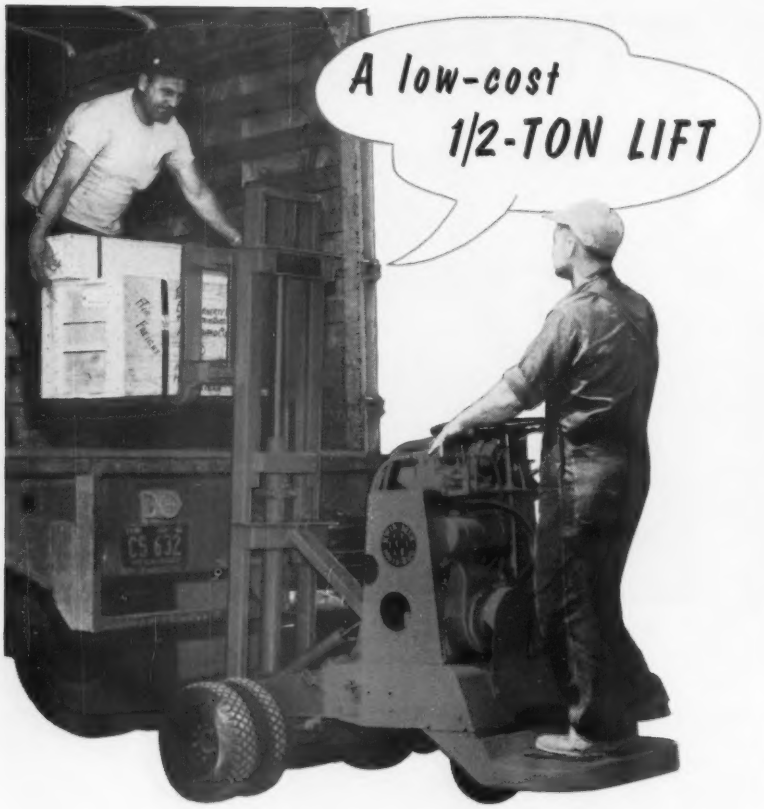
Examples of castings produced by the company in blown molds

pounds of sand is blown into each mold, and hardness ranges from 85 to 90. Castings produced in the top or bottom of the stack show only ¼-oz difference in weight for a 7 in. diam sheave.

Allow for Mold Venting—Provision for adequate venting of mold gases is made by adjusting the squeezer ram unit of the machine and by use of an upset to provide for a uniform extension of the finished mold beyond the edge of the flask. Thus when molds are stacked, there is sand-to-sand contact and space between flasks for gases to escape.

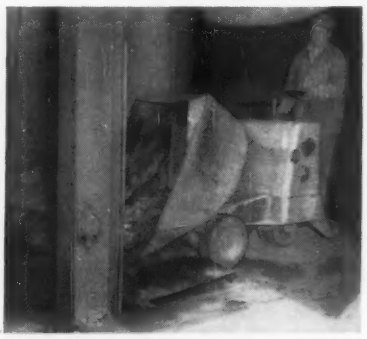
Sizes of sheaves produced on the machine range from 3 to 15 in. pitch diameter with up to a 2-in. face. Diameters increase by 0.2 in. up to 7 in. and in somewhat larger increments to 15 in. Consequently, several patterns are required to produce these stock sizes. To reduce pattern cost, the company developed pattern plates with a number of standard size openings into which loose inserts covering the range of sheave sizes are placed. The base of these inserts fits into one of the standard size openings. Various size patterns are mounted on these inserts. In addition, the top pattern plate contains blowholes and vents spaced so that sand will be fed properly to the mold. To facilitate rapid job changeover, the spacing also must be such that the holes will align with holes in the master blowplate of the machine. Unused holes in the master plate are plugged automatically when the insert patterns are changed for different size sheaves.

Machine Operation — An operator places an empty flask from a return gravity roller conveyor on the locating pins of the machine turntable. The table indexes, placing the flask over the cope pattern and under the machine blowhead. The cope pattern is mounted inside the upset and the entire assembly is raised by air ram so that the upset engages the bottom edge of the flask and carries it up



Low-cost Moto-Bug puts fork lift service within economical reach of small foundries — and has unlimited usefulness as an auxiliary lifting tool in large shops. It handles a lot of light-load work where the cost of operating big, expensive lift trucks is prohibitive. Kwik-Mix S-10 Moto-Bug lifts 1000 pounds (at 15-in. load center) to 6-foot height. Forks are 20 or 30 inches long, adjustable 6 to 32 inches wide. Tilting mast optional. There's full power forward and reverse — safe, automatic "deadman" brakes. Turning radius is only 61 inches — overall width 39 inches.

3-Way usefulness — You can add an interchangeable hopper body, or flatbed platform for hauling loads up to 1500 pounds. This gives extra earnings on your original investment — provides 3-tool usefulness for all kinds of material-handling. Larger-capacity R-15 Moto-Bug with multiple attachments is also available at low cost. See your Kwik-Mix distributor soon — or send for Moto-Bug catalog today.



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KWIK-MIX COMPANY, Port Washington, Wisconsin

Send literature on S-10 Moto-Bug with: ☐ fork lift ☐ hopper ☐ platform

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against the drag pattern, which also serves as the blowplate. Sand is blown. Then, while the mold is in blow position, an air-hydraulic ram pushes the lower pattern upward a predetermined distance for the squeeze. The upset, being tight against the flask, does not move and thus provides the mold extension below the flask.

After the assembly is lowered, the table indexes and an unloading device lifts the mold section from the machine, turns and sets it on a bottom board on a second roller conveyor. The machine operator places a plug core in the sprue hole. The machine unloader stacks subsequent sections over the first.

When eight sections have been set, the stack is pushed along the conveyor, and weights are placed.

Use Simple Shakeout Device—Bottom boards are made so that the arms of a bail rig on a hoist can be slipped under the stack. With this arrangement, the shakeout man lifts the poured stack from the pouring conveyor and moves it over a floor grating. Two I-beams mounted on overhead structural members of the building extend down over the grating. The stack, carried by the hoist, is positioned under the beams and raised. Sand and castings thus are pushed from the flasks by the beams. Then the empty flasks are separated and set on the feeder conveyor where they roll into position to be picked up by the machine loader.

Ingates about 1/16 x 1 in. are used to feed sheave castings. Consequently, as castings are pushed out of the mold and fall to the grate, most of them break off the gating system, leaving a very small stub. Rough castings are not ground but go immediately to the machine shop where the small ingate stub is removed as the V-belt grooves are cut.

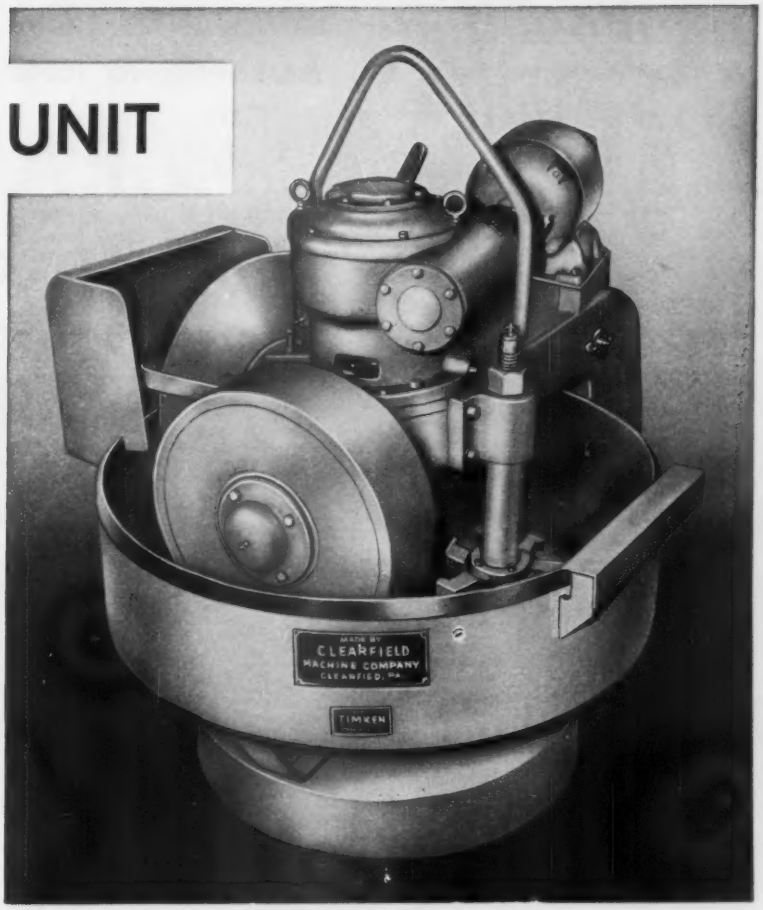
Molding sand is prepared at a central station in 3000-lb batches. Additives to each batch consist of 2 qt plastic bonding agent, 2 qt western bentonite and 8 qt hard wood flour. Moisture is held within 3.2 - 3.8 per cent. Properties are 15-16 psi green strength, 65-67 permeability, 85-90 squeeze hardness.

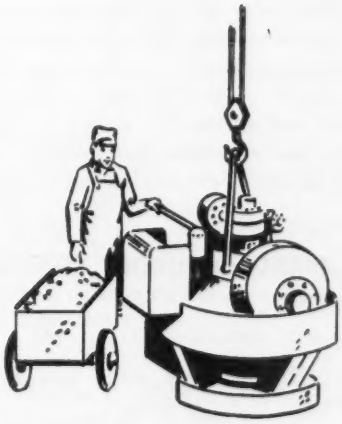
Prepared sand is delivered by overhead belt conveyor to the molding area. A jumper belt carries sand from the main distribution conveyor to a storage bin over the blow-squeeze machine. A plate feeder feeds sand to the machine hopper.

The blow-squeeze machine and automatic stacking device are made by the San-Bio Dept., Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland.

ONE MIXING UNIT for all sand preparing purposes

the CLEARFIELD No. 414





CLEARFIELD MIXER
the choice of
industrial leaders

Being small, compact and of low power consumption, the Clearfield No. 414 is ideal for plants where the sand preparation system is built around the portability of the mixing unit. When suspended from a crane or monorail hoist by means of a hook that is provided, the Clearfield Mixer may be carried over the entire molding area. The machine is perfectly balanced and may be loaded, operated and discharged while suspended above the floor. Mixes may be changed from one type to another as often as necessary without contaminating the succeeding charges. If crane facilities are not available, or if they are not desirable, the Clearfield can be equipped with roller bearing casters to retain the feature of portability.

For more information on portable mixers, write today for our Catalog No. 83

CLEARFIELD MACHINE COMPANY

CLEARFIELD, PENNSYLVANIA, U. S. A.

Circle 687 on Page 51

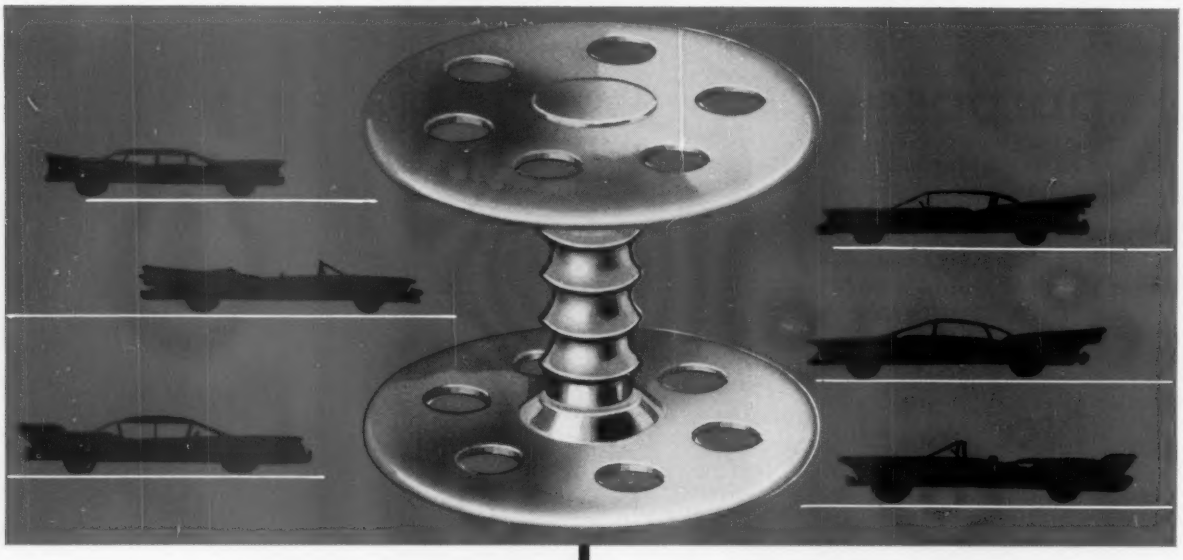
automobile styles may change...

but motor car manufacturers unanimously choose

fine FANNER

DOUBLE HEAD MOTOR CHAPLETS

for producing sound, uniform castings



The tremendous flow of uniform, sound castings necessary to the automotive industry must be maintained with no sacrifice in quality. That's why more Fine FANNER motor chaplets have been used by more producers of automotive castings than all other types combined.

Fine FANNER motor chaplets with their exclusive designs, their positive core support, accuracy of production and their complete fusion help produce better, sounder castings at lower cost.

Prevent costly product failures due to unsound castings by using fine FANNER motor chaplets for all your requirements.

Only a few of the wide range of motor chaplets made by FANNER are shown here — get acquainted with the complete line by writing today for your free copy of the FANNER Chaplet Catalog.

ENGINEERING SERVICE

Qualified and specialized engineers in Fanner's Technical Service Division are available for consultation, without obligation, on problems of producing more intricate castings; developing increased strength, closer tolerances, and better quality; reducing machining and improving finish — both in ferrous and non-ferrous castings. Take advantage of the research and development work that Fanner has invested in this field to improve your profit picture! Simply direct your request to the address shown below.

THE FANNER MANUFACTURING COMPANY

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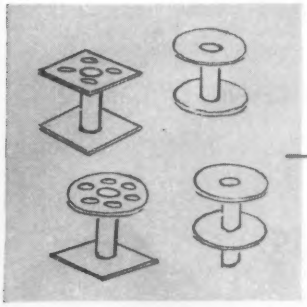
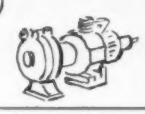
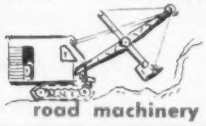


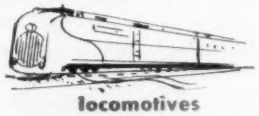
there are fine FANNER MOTOR CHAPLETS for many other products . .



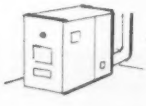
pumps



road machinery



locomotives



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Circle 643 on Page 51

WHY MANAGEMENT MUST TRAIN EMPLOYEES

Proper Training Is a Prudent Investment

By F. G. SEFING*
International Nickel Co.
New York

RECENT surveys of manpower and training needs of the foundry industry by the U. S. Department of Labor, reported by John S. McCauley in FOUNDRY for July, 1956, and July, 1957, showed that thousands of foundry workers require various amounts of training, depending on the skills required.

With the trend toward more semiskilled and skilled manpower to meet the production demands of modern foundries, management necessarily will be giving more thought to training plans. Another significant point brought out in these surveys is that patternmakers, molders, and coremakers are considerably older than average skilled mechanics in other industries.

With the constant rise of quality of castings, the need for better trained men to make these castings becomes greater in every phase of the foundry industry. A challenge to management therefore exists to provide better trained men.

Such a challenge is not new to the foundry industry. It has, for example, through the Foundry Educational Foundation program, provided engineers for foundries from selected engineering colleges; and training programs in foundry technology have been initiated by the Training & Research Institute of the American Foundrymen's Society for selected personnel. It remains, however, for management to organize co-operative training programs, in all areas where foundries exist, to train semiskilled and skilled operators, molders, coremakers, patternmakers, technicians, and maintenance mechanics to meet the manpower needs of the more complicated operations of modern foundries.

From 400,000 to 450,000 people are employed in the foundry industry, and most of them require training ranging from a few weeks to four years, depending on the required skills. Furthermore, the training of foremen and management personnel adds to the demand for organized training. Generally, about 10 per cent of industrial employees are replaced annually because of retirement, death, leaving the industry, etc. It is required then, that some type of training be given to approximately 45,000 to 50,000 people per year to keep the foundry manpower supply adequate. If, therefore, 25 foundry training centers were provided in suitable locations around the country, each center would have to train about 2000 people a year, or each of 500 centers would have to train 100 people each a year, just to keep the supply at its present level.

Foundries employing 500 or more may be able to afford to organize their own training program. On the other hand, the many foundries with fewer than 500 employees might well consider setting up co-operative training programs for basic training, leaving only the specialized training to be done on the job in the foundry.

To the end of setting up training programs for particular foundries or for a group of foundries, the use of the AFS Educational Division training outlines and the assistance of AFS Chapter Educational Committees and vocational and trade school teachers can be utilized. In addition, the advice and experience of vocational training personnel operating in most states, of teachers under the Smith-Hughes Act operating through the land grant colleges, and of the Bureau of Apprenticeship of the U. S. Department of Labor can be solicited. The experience of all these agencies can be utilized at low cost to achieve a flexible program suited to local foundry needs.

Management often is hesitant about starting training programs simply because it has had little experience in this work. Actually, it is not difficult, and hardly anything else is so gratifying and so fruitful in improving skills, attitudes, and labor relations as a simple training program.

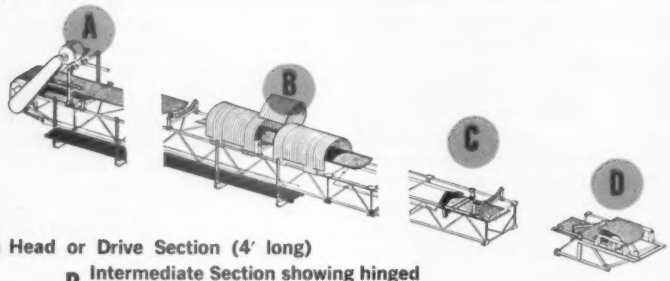
One of the pitfalls commonly encountered is to initiate too broad or all-encompassing a training plan. It is urged strongly that the foundry or group of foundries put on a short series of lectures or meetings on some important foundry subject, led by a qualified person. The objectives and the steps to be taken or the outline of them should be clearly stated. The results of such a short course generally are gratifying enough to encourage courses in other subjects. The experience gained from these more simple training courses can be used to develop other courses, even though they are longer or more technical in course material.

In all this work, the assistance of local high school teachers, the state vocational educational personnel,

*Mr. Sefing is chairman of the Foundry Advisory Committee to the U. S. Department of Labor.

NEW IDEA in prefabricated belt conveyors

JOY READY-SPAN tubular design requires no special engineering



A Head or Drive Section (4′ long)

B Intermediate Section showing hinged cover (20′ –8′ –4′)

C Intermediate Section showing optional return belt cover

D Tail section showing takeup and belt plow (4′ long)

Just tell us the length, the speed, and the material you want to move and we can pull a Ready-Span prefabricated conveyor "off the shelf" for you. You'll get all the economies of pre-engineering plus all the advantages of a conveyor installation tailored to your needs.

Here's how it works: each section, including drive and tail terminals, is made up of four pipes connected by pipe diagonals forming a lace framed truss. Sections bolt together to form a straight, rigid, pipe frame truss.

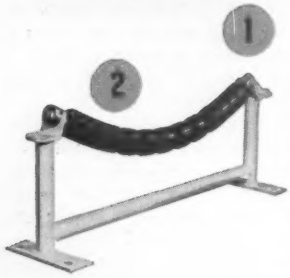
All accessories—idlers, walkways, cover decking, hoods and supports clamp to the pipe anywhere you wish—without burning holes or using pre-arranged multiple holes that weaken the conveyor.

The Joy Ready-span is available in a variety of drive and take-up combinations for any standard belt width. Promptly available from stock to meet almost any handling condition.

Write for Bulletin 218-13

NEW IDEA in conveyor belt idlers

JOY LIMBEROLLER



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Radically different from all other idlers, the Limberoller is a single roll idler consisting of neoprene discs molded to a flexible steel cable. The entire idler turns on its own axis. (1) Only two bearings are used, one at either end, up out of the dirt. (2) The idler supports the belt across its entire width . . . eliminates gaps left by ordinary 3-roll idler. This even support, combined with cushioning "no-bump" action of neoprene discs, can increase belt life 6 times and more. The Limberoller can be installed on *any* belt conveyor, even on existing conveyors.

WBW L6967-218

JOY *Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*

In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Smith-Hughes teachers, etc., can be of help not only in organizing the course outlines, but also in selecting group leaders. AFS Chapter Educational Committees and the Bureau of Apprenticeship personnel also can be of help in outlining courses and setting up programs.

It is evident that training of foundry employees in a wide variety of skills and technology is needed. It obviously is management's responsibility to arrange for the training of its personnel. Since there is so much material and guidance available through the AFS, schools, colleges, and boards of education of towns, cities, and states, no foundry manager should hesitate to proceed promptly to fulfill these manpower needs. No effort by management will afford better preparation for the future of his company than the proper training of plant personnel. Furthermore, no investment of time and money can yield such a high return as this step.

National Engineering Co. Creates New Subsidiary

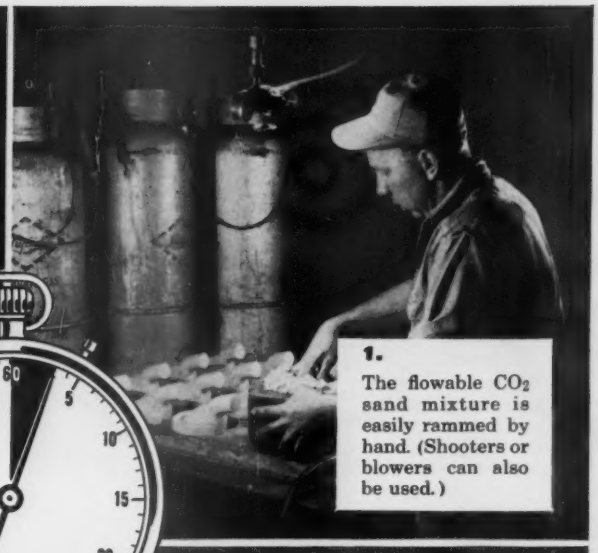
National Engineering Co., Chicago, has formed National Air Conveyor Corp., a wholly owned subsidiary, which will design, engineer, and manufacture pneumatic conveying equipment for the transport of bonded materials in the foundry. The new firm will be located at 549 W. Washington St., Chicago, Ill.

National's decision to enter the pneumatic transport field was based on several considerations: 1. Acquisition of existing patents and development by National of improved equipment. 2. The new company will provide an extension of National's existing sand handling services and equipment. 3. National's background of experience with the engineering and installation of such systems. 4. The fact that the new subsidiary will be organized to provide complete design, engineering, and erection services and complete service and repair parts facilities.

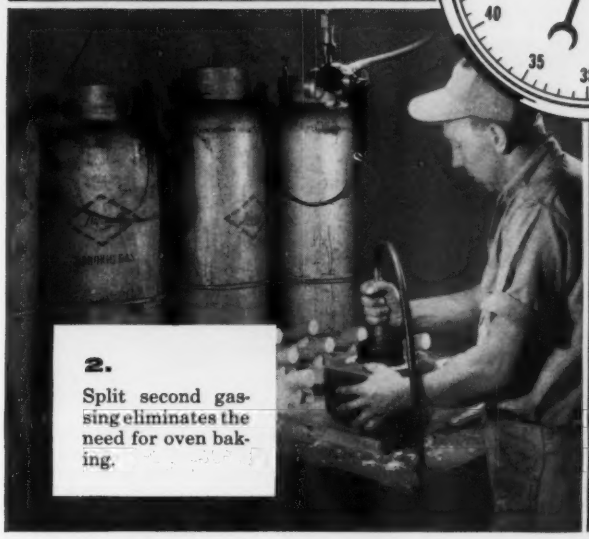
The National system will be capable of delivering sand to two points at the same time. Use of a bilateral valve and two transporters is said to eliminate downtime on such a system. Both switches and diversion valves will be offered with the system. A patented feature insures positive alignment and sealing between the removable pipe section and fixed line to the baffle box. Design of the baffle box receiver reportedly is such that little maintenance is required. Replacement of baffles is said to be infrequent and relatively simple.

COMPLETE CORE IN 3 MINUTES

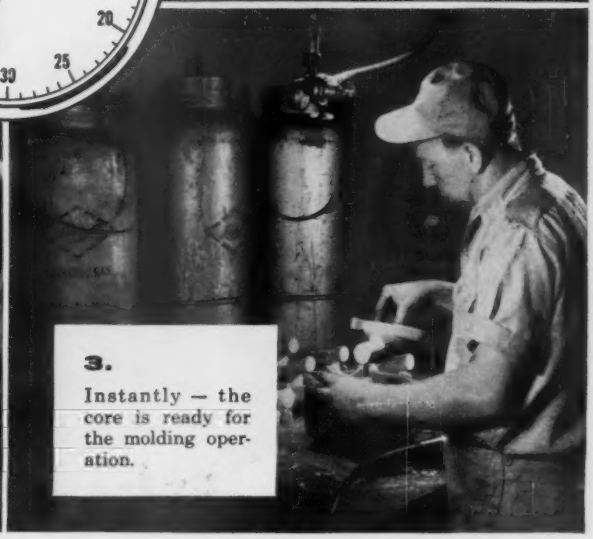
Rammed, Gassed and Removed!



1.
The flowable CO_2 sand mixture is easily rammed by hand. (Shooters or blowers can also be used.)



2.
Split second gassing eliminates the need for oven baking.



3.
Instantly — the core is ready for the molding operation.

The CO_2 process proves to be a fast and economical method for core production at the J. M. Bruce Foundry in Cedar Grove, Wisconsin.

CO_2 PROCESS INCREASES CASTING CAPACITY . . . CUTS EQUIPMENT COSTS . . . ELIMINATES CORE STORAGE!

Glen and Mark Bruce, who operate the 40 year-old J. M. Bruce Foundry Co., are enthusiastic about the use of CO_2. An actual cash savings of thousands of dollars is reported due to the decrease in baking equipment and core storage. Valuable floor space previously used for core storage is now allocated to actual production use.

For J. M. Bruce Foundry Co. the big advantages in CO_2 are the increased size of the castings they can pour (without buying special core equipment)—50% reductions in core costs . . . virtual elimination of "plows". . . no danger of drops, soft or wet spots . . . reduced core handling, extreme speed and flexibility in supplying core needs, and *making cores only when they need 'em.*

Get the facts on CO_2 core and mold making—complete information sent upon request.

World's Largest Producer of

LIQUID CARBONIC

DIVISION OF GENERAL DYNAMICS CORPORATION

3150 South Kedzie Ave., Chicago 23, Illinois

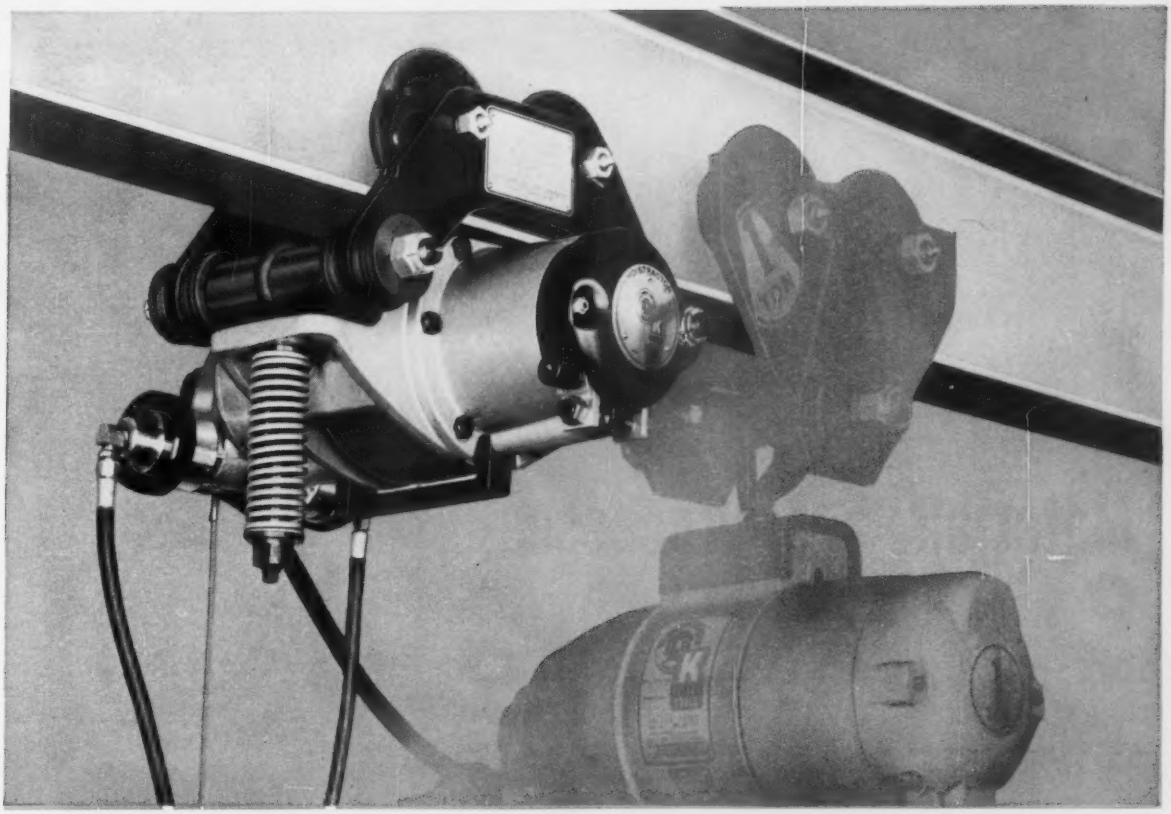
News Views

FOUNDRY EXHIBIT: Booth at left is the exhibit of the Cast Metal Industry as set up at the recent Career Carnival at Michigan State University. The exhibit was sponsored by the Detroit, Central Michigan, Saginaw Valley, and Western Michigan chapters, AFS; the MSU student chapter of the AFS; and the Foundry Educational Foundation. An estimated 14,000 students visited the Career Carnival during the 1½ days it was open.

NEW APPOINTEE: At a recent National Defense Executive Reserve Conference in Washington, the appointment of Niels A. Olsen as director, Metalworking Equipment Division, BDSA, was announced. Mr. Olsen will be responsible for the activities of the division of the BDSA as they relate to metalworking equipment industries. Above, left to right, are Neil H. McElroy, secretary of defense, Mr. Olsen, and Swan E. Bergstrom, executive vice president, Cincinnati Milling Machine Co., Cincinnati

KENNEDY SCHOLARSHIPS: At a recent meeting of the Chicago AFS chapter, scholarships from the Robert E. Kennedy Scholarship Fund were presented to Gunther G. Wackerman, Thomas R. Hoogervorst, and Roy G. Hlavacek, University of Illinois students. Left to right, above, are Fred W. Trezise, Chicago Undergraduate Division, University of Illinois; Mr. Hlavacek; Mr. Hoogervorst; Roy W. Schroeder, University of Illinois; Mr. Wackerman; Robert P. Schauss, Werner G. Smith Inc., Kennedy Scholarship chairman, and W. O. McFatridge, International Harvester Co., chapter president

SCHOLARS: Fourteen scholarship-winning engineering students at University of Wisconsin are shown above with some members of the Foundry Educational Foundation University Advisory Committee and officials of the FEF. Seated, left to right, are Carl E. Wulff and Carl R. Roper Jr., UW faculty; E. J. Walsh, FEF executive director; C. V. Nass, Beardsley & Piper, Chicago, FEF president; James E. Ewens, Grede Foundries Inc.



New HOISTRACTOR adds push-pull power to any beam hoist

Now, it's an easy one-man, one-hand operation to raise, lower and move loads up to two tons. Simply use Gardner-Denver's new Keller "Hoistractor." This air-powered hoist trolley—connected to any beam hoist by a drawbar—rides the same beam as the hoist. Hoist lifts and lowers . . . "Hoistractor" moves hoist and load along the beam.

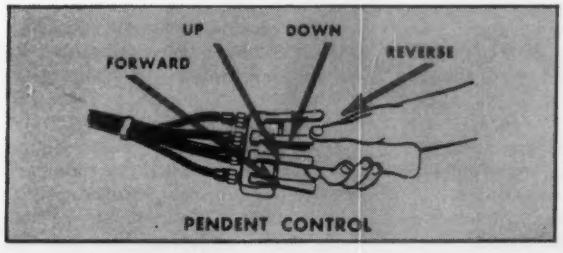
This new tractor unit simplifies moving heavy loads to truck, stock bin, machine tool or dip tank. Now, one man handles jobs such as these with greater speed and safety—without fatigue.

Powered by an axial-piston type air motor, the powerful, lightweight "Hoistractor" exerts 250-lb. drawbar pull on a beam. Speed is variable from slow creep to full-load speed of 70 ft. per min., with a no-load speed of 150 ft. per min.

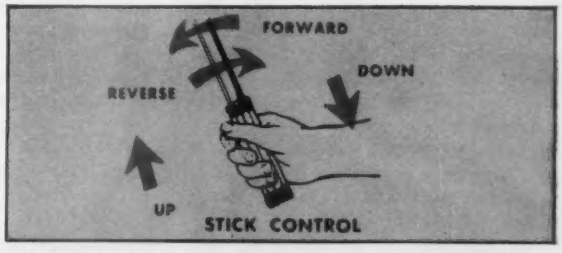
Sensitive air controls permit smooth acceleration and deceleration . . . accurate load spotting. Powerful enclosed mechanical brake, easily adjusted, provides positive, safe stopping.

Get all the facts on the new Keller "Hoistractor." Request Bulletin 87-1.

ONE-HAND CONTROL—TWO TYPES AVAILABLE



Squeeze hand grip has up-down operating levers for hoist and fore-aft levers for "Hoistractor."



Swiveled rod with four-way grip control. Raising or lowering the grip raises or lowers hoist load.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Circle 646 on Page 51

INVESTMENT CASTERS STUDY

Materials and Processes

By ROBERT H. HERRMANN
Associate Editor

THE Investment Casting Institute's fifth annual meeting drew 95 to the Sheraton Hotel in Chicago, Nov. 19-21. Committee meetings dominated the first day, the second day was devoted to technical discussions, and the business session, including election of officers and directors, was held on the last day.

The institute, through President Thompson, presented its Whale Award to Vincent S. Lazzara, president of Casting Engineers Inc., Chicago, for his "devotion to the institute since its inception." Mr. Lazzara has served as treasurer, vice president, and president of the group and also conceived the idea of the Whale Award several years ago. Dr. Richard A. Flinn, University of Michigan, also received the award for liaison work between the university and the institute in disseminating educational information on the investment casting process. Symbol of the award is an investment cast, stainless steel whale mounted on a rosewood block.

In opening the technical session, President Thompson told of his visits to investment foundries throughout the country. Western foundries are in a greater business slump than those in the Midwest and East. Being heavily engaged in military work, they are operating at about 50 per cent capacity because of cutbacks in the military program.

First of the technical papers, **Induction Melting and Carbon Arc Melting of High-Alloy Steels,** was by L. J. DiNuzzo, process metallurgist, Specialty Castings Foundry, General Electric Co., Schenectady, N. Y. The two melting methods were compared with reference to the effect of casting design on pouring techniques, relative cost, melting control as it affects reproducibility of results, and versatility.

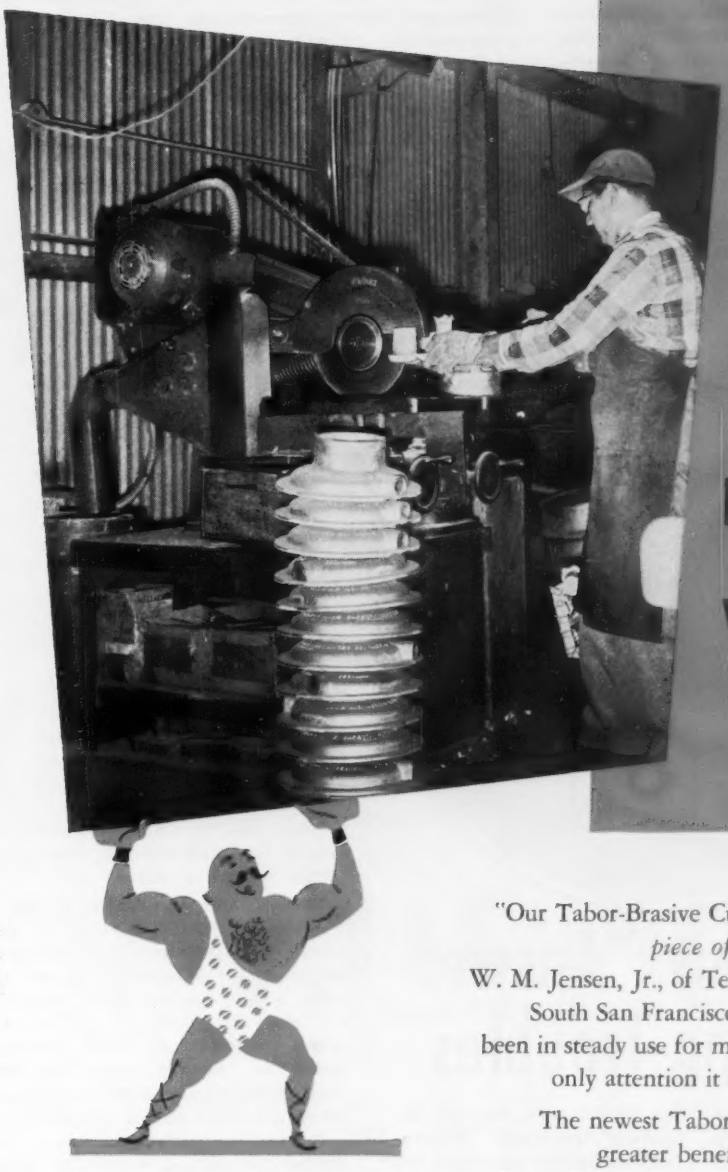
Because of the trend, particularly in the aircraft industry, to use stainless steel and high alloys with marginal strengths and less safety factor in an effort to reduce weight and improve performance of aircraft, reproducibility of reliable castings is assuming greater importance. Induction-melted alloys in 100 to 200-lb heats are said to offer advantages of closer control over metal chemistry, temperature, gas content, melt history, and deoxidation practice. With closer control, reproducibility is more likely to be achieved.

Investment Casting Production Control—by Robert H. Roehl, supervisor of production control, Investment Casting Division, Howard Foundry Co., Milwaukee. A system of control over jobs in production using tear-off tickets, route forms, a master product control board, and telautograph equipment was described. The system assures that all work and inspection have been performed on a batch of castings in a given department before the castings are moved to the next department. Also it shows the location of all jobs and provides a continuous inventory of castings.

Engineering Properties of Low-Melting Plastic Pattern Materials—by Dr. Charles J. Marsel, Department of Chemical Engineering, New York University. The merits of conventional wax and conventional plastic investment casting patterns were outlined. Generally, waxes have low tensile strength. Strength is increased by additives amounting to 5 to 10 per cent. In this way the properties of wax and plastic can be combined and formulations developed to provide the exact characteristics desired. The viscosities at various temperatures of a number of wax-plastic compositions were discussed.

How To Reduce Costs and Extend the Life of Flasks—by Paul T. Goetcheus, president, Rolled Alloys Inc., Detroit. A recent survey indicates that a little less than half the flasks used deteriorate from mechanical abuse and a little less than half deteriorate from scaling. Deterioration by other types of corrosion accounts for a few. Although furnace atmospheres are highly oxidizing, flask exteriors are affected much less than interiors.

Carbon and its compounds formed



"... the only trouble-free piece of equipment we've ever owned"

Model B-7½-AC Tabor-Brasive Cut-Off Machine, in ten years of maintenance-free service at Terminal Brass and Aluminum Foundry, South San Francisco, California. Strictly a jobbing foundry, Terminal cuts both aluminum and brass, large and small items, in volume or on small orders.

"Our Tabor-Brasive Cut-Off Machine is the *only trouble-free piece of equipment we've ever owned,*" writes W. M. Jensen, Jr., of Terminal Brass and Aluminum Foundry, South San Francisco. "We bought it new in 1947, and it's been in steady use for more than 15,000 hours. Absolutely the only attention it ever needed was two V-belt changes!"

The newest Tabor-Brasive Cut-Off Machines bring even greater benefits to the production foundry. On the redesigned 5 hp machine, there's increased table room and a full range of cutting service. The 15 hp machine, with its new hydraulic table lift, gives less operator fatigue and faster cuts. Cuts any metal. Brass, aluminum, iron or steel — they're all the same to a Tabor Machine.

If mechanization will meet your problems, the man to see is the Tabor Man. Call him — or write for detailed data.

TABOR

THE TABOR MANUFACTURING CO.
Division of Turbo Machine Company
LANSDALE, PA.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Circle 626 on Page 51

between the investment material and the flask are prime causes of corrosion. Their effect can be minimized by using corrugated flasks which allow carbon to be burned out before corrosion starts. Also flasks can be coated with aluminum oxide, or aluminum foil can be used in place of paper for a flask liner.

Personal Observations on the Russian Steel Industry—by Dr. Nicholas J. Grant, professor of metallurgy, Massachusetts Institute of Technology. Drs. Grant and John Chipman of MIT visited Russia and Siberia recently as guests of the Russian Academy of Science. Tours were made of steel mills, teaching institutions, and research organizations.

Russia is stressing science and engineering education. Very little effort is devoted to business and general subjects. The social status and money rewards for professors, students, and workers in scientific and engineering fields are quite high, and young people are well aware of that fact. In the field of metallurgy Russia is turning out 4500 graduates a year as against our 650.

A few Russian steel mills are comparable in equipment and capacity to some of our better ones; some are not. Several of the firms operate foundries in conjunction with their steelmaking facilities.

Dr. Grant's general observations are that lack of extensive transportation facilities is a big stumbling block to growth of Russian industry. Although Russians propagandize against the United States and its way of life, their every effort is devoted to duplicating or exceeding our production and other achievements.

Trends in Metal Technology — by Roger Waindle, president, Wai Met Alloys Co., Detroit. Current trends, particularly in military procurement, indicate a swing to castings on the basis of quality and cost. These trends show a decreased importance of test bar data which often do not give a true picture of casting quality. Also there is a change in inspection standards, a realization that transverse properties of wrought products are poor, that castings have better omnidirectional properties than forgings, and a better understanding of design failures.

Because castings can be made conveniently into intricate shapes and into shapes resistant to brittle failure, design is assuming greater importance in lowering the need for super alloys in critical parts. Brittle lacquer testing techniques can be helpful to foundrymen in developing proper design of parts.

Pattern and Investment Clinics— A series of tests on investment materials was explained and conducted to demonstrate consistency, setting time, setting temperature, material fineness, and inclusion of contaminants. Additional tests included those on setting expansion and thermal expansion and compressive, transverse, and tensile strengths.

Similar demonstrations were conducted for pattern materials. They included flow point, thermal expansion, penetration, and ash content.

The demonstrations were made by representatives of supply firms under direction of the ICI Process Materials Committee.

The following officers were elected by the institute: President—P. W. Schipper, Howard Foundry Co., Milwaukee; vice president—Robert R. Miller, Precision Metalsmiths Inc., Cleveland, and treasurer—William L. Worthen, Bone Engineering Corp., Glendale, Calif. Harry P. Dolan continues as executive director of the institute.

Directors for one year are K. W. Thompson, K. W. Thompson Tool Co., New Hyde Park, L. I., N. Y., re-

Use this "Answer-to-Casting-Troubles"

Casting metals at just the right temperature is what eliminates many "casting troubles". Where Marshall Enclosed-Tip Thermocouples are used in checking molten metal temperatures, many casting flaws are avoided, and sound castings result.

Marshall Thermocouples are dependable instruments used everywhere in nonferrous foundries. They give prompt temperature reports from inside the melt, and can be relied upon for accuracy. Two convenient types are available: for ladle or furnace use.

Let our Catalog, sent free, give you more data. L. H. Marshall Co., 270 W. Lane Ave., Columbus 2, Ohio.

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NEVILLE PIG IRON

IF you're a jobbing foundry man, we don't have to tell you about the great variety of gray iron castings you produce in your shop. All you have to do is leaf through your production schedules for the past six months for a reminder of the great diversity of sizes, patterns and analyses which you cast to specification.

The point is this: Because we not only produce but *stock* Neville Pig Iron in a wide variety of analyses, we feel we can help simplify your pig iron supply problem considerably. We can ship Neville Pig Iron in virtually any analysis and quantity you may need . . . and on schedule!

We'd like to talk over your specific pig iron requirements . . . and offer you our technical assistance without obligation. *Write or call today.*

Neville Pig Iron and Neville Coke for the Foundry Trade

WSW 6096

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what's in a name?

To these proud parents there's only one "Johnny"!

In the field of metal abrasives, there's only one "MALLEABRASIVE", and that's our baby!

"MALLEABRASIVE" is the name of the world's first malleablized abrasive, researched and developed by Globe and famous Battelle Memorial Institute.

No other metal abrasive is the same because only Globe uses the complete process which gives Malleabrasive its own distinctive metallurgical structure.

What's in a name? Just this — the name MALLEABRASIVE represents a standard of excellence that prompts Malleabrasive users to ask, "Is it as good as Malleabrasive?" when urged to buy something similar.

Sold by Pangborn Corporation, and by leading distributors of foundry supplies from coast to coast.

MALLEABRASIVE

THE GLOBE STEEL ABRASIVE CO., MANSFIELD, OHIO ®

1907—Fiftieth Anniversary—1957

tiring president; W. I. Matthes, Arwood Precision Casting Corp., New York, and F. W. Glaser, Alloy Precision Castings Co., Cleveland. Two-year directors are J. H. Morrison, Hitchiner Mfg. Co., Milford, N. H.; Theodore Operhall, Misco Precision Casting Co., Whitehall, Mich.; L. R. Schwedes, Lawrence Laboratory, Santa Monica, Calif., and R. E. Gray, Gray-Syracuse Inc., Manlius, N. Y.

Albion Malleable Iron Co. To Aid Brazilian Foundry

Albion Malleable Iron Co., Albion, Mich., has contracted with Conexoes de Ferro Foz, Sao Paulo, Brazil, to furnish technical and manufacturing assistance to establish the Foz foundry as a producer of malleable iron automotive castings.

Foz has a highly mechanized modern foundry for the production of whiteheart malleable iron pipe fittings and plans an expansion into automotive production since recent regulations by the Brazilian government limit the import of automotive components. Designed to develop a domestic industry and to reduce Brazil's dependence on outside sources, the regulations require that Brazilian industry produce at least 90 per cent of truck components by 1960.

The agreement between Albion and Foz provides that representatives of Foz will spend prolonged training periods at Albion's plant to become acquainted with American practices. In addition, Albion technical and manufacturing personnel will be sent to the Brazilian plant.

Time Study Films To Be Shown At New York Workshop Jan. 31

For the first time since they were issued in 1950, the internationally used SAM Time Study Performance Rating Films will be shown in New York at a full-day rating workshop to be heid at the Belmont-Plaza Hotel, Jan. 31.

Registrants will have the opportunity to rate the 120 actual performances of 24 typical factory and clerical operations. They can compare their own ratings privately with the composite judgments of 1200 experienced time study engineers representing 181 companies. Each rating session will be followed by a discussion period open to participants.

Details on registration for the workshop can be obtained from the Research Div., Society for Advancement of Management, 74 Fifth Ave., New York 11, N. Y.

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New ELPAR R-10 series fork truck.

Twice the Life... 1/3rd the Operating Costs

In buying power industrial trucks, look beyond initial costs—and you'll discover these overwhelming advantages of ELPAR electric trucks:

- ELPAR electric trucks last at least twice as long as gas trucks operating under comparable conditions. Thus, when *all* initial and replacement costs are added up, ELPAR trucks actually *cost less to buy.*
- ELPAR truck operating and maintenance costs are only one-third those of comparable gas models. Based on 2,000 hours of operation, this means an average saving in direct operating costs of over *$1,200 per truck per year.*

These facts are based upon actual case studies from a number of plants. They explain why 75 of the 100 largest U. S. corporations now are using ELPAR trucks . . . and why more and more companies are converting their fleets to ELPAR electrics.

Learn how ELPAR trucks can make short work of your toughest materials handling problems —with an almost unbelievably high bonus of savings . . .

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Around the Country

NEWS REPORTS FROM

Cleveland . . . Chicago . . . Pittsburgh . . . Boston

Cleveland—E. Claude Jeter, chairman, Northeastern Ohio Chapter of the American Foundrymen's Society, and General Committee Chairman for the 1958 Casting Congress and Show to be held in Cleveland May 19-23, has appointed chairmen for the convention committees. The appointments, released recently by Emil J. Romans, executive chairman of the General Committee, are:

Honorary Chairman: Frank C. Dost, Sterling Foundry Co., Wellington, Ohio, a past national AFS president.

General Committee: Mr. Jeter, Ford Cleveland Foundry, chairman; Mr. Romans, National Malleable & Steel Castings Co., executive chairman.

Shop Course Committee: Frank C. Cech, Cleveland Trade School.

Plant Visitation Committee: A. H. Hinton, Aluminum Co. of America.

Banquet Committee: Lewis T. Crosby, Sterling Wheelbarrow Co.

Chapter Day Committee: Norman J. Stickney, Sand Products Co.

Publicity Committee: Robert H. Herrmann, FOUNDRY.

Ladies' Entertainment Committee: Mrs. E. Claude Jeter, chairman; Mrs. Emil J. Romans, cochairman.

Ladies' Registration Committee: Mrs. Howard E. Heyl.

Harold R. Strater is liaison officer between the chapter and ladies' committees.

The national AFS office plans to mail housing applications to all society members on Jan. 15. Advance registration forms will be mailed about Feb. 15.

Boston—The brass and bronze foundry under construction at Braintree, Mass., by the Walworth Co. will have an initial annual capacity of 18 million pounds. Plans permit future expansion to 27 million. On completion, the bulk of the company's brass and bronze pouring will be concentrated at Braintree, with some work transferred there from Greensburg, Pa.

Major equipment at the new foundry includes three, 225-pound capacity electric induction furnaces, and the plant will be mechanized with considerable material handling equipment. The Greenburg foundry will produce malleable and steel castings in both shell and sand molds. Gray iron capacity at the Kewanee, Ill., foundry is being increased by 300 tons to 1500 tons a month, while the Greensburg shop is completing mechanization installations.

The new capacity and mechanization at Walworth's three plants will reduce dependence on job shops for its casting needs, particularly gray iron.

Gray iron and malleable shops start the year with low backlogs; most foundries are operating under four-day-week schedules. Producers of steel castings are relatively busier, although backlogs dropped during fourth quarter. Valve and heavy electrical equipment volume holds relatively active.

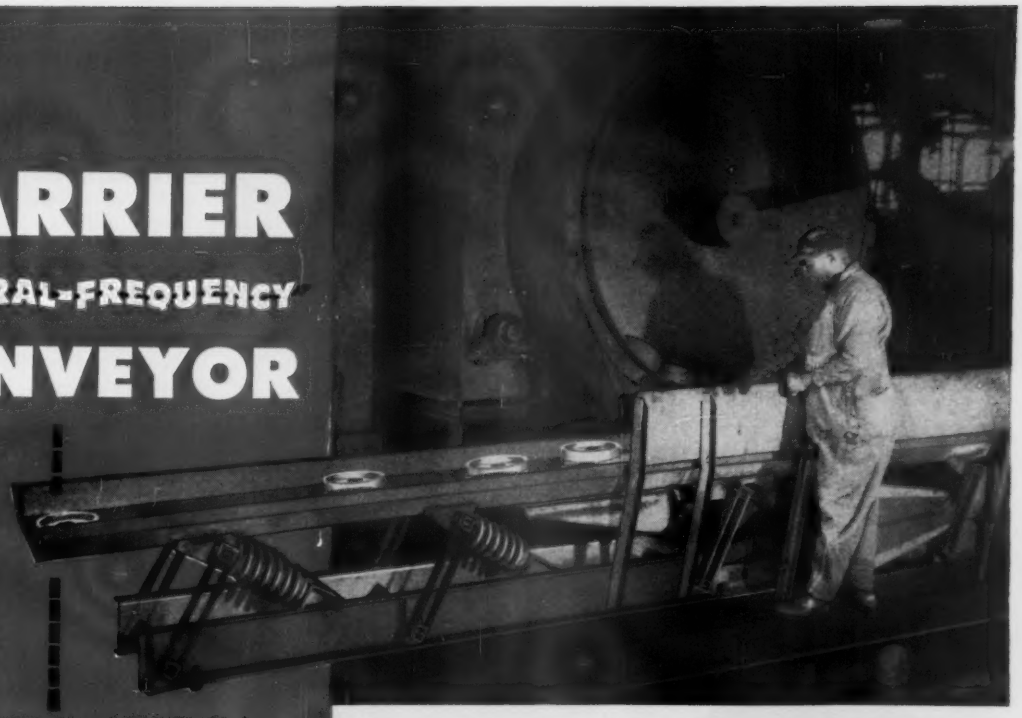
Foundries supplying castings to machine tool and textile mill equipment builders need orders. In this group are several of the larger capacity mechanized shops and most are operating partly as jobbing units; one machine tool foundry is also looking around for outside work. Competition from this group with regular jobbing foundries is sharp. Scrap prices are lower. Pig iron melt is off nearly 20 per cent from last year.

METALS PROCESSING: New and advanced metal processing techniques and products, designed to meet present and future requirements of the national defense program and industry, were demonstrated and displayed recently by the Metals Processing Division, Curtiss-Wright Corp., at the Lexington Suite, Waldorf-Astoria Hotel, New York. The showing was made to technical personnel in manufacturing industries. The Foundry Division of the company plays an important role in meeting the challenges of tomorrow's technology, as witnessed by the emphasis given this presentation of controlled foundry processes

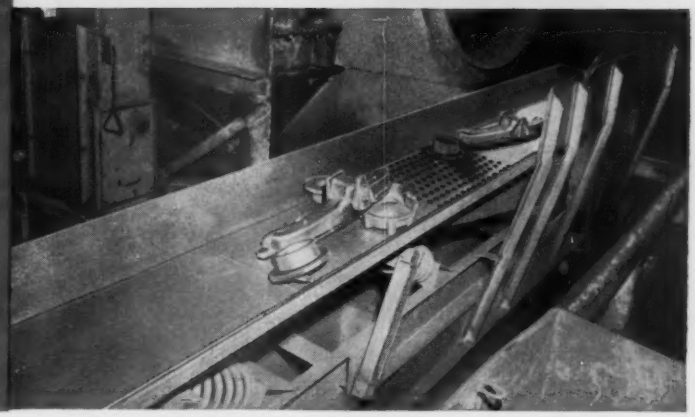
Chicago—The majority of gray iron foundries in the Chicago area are running 32 hours a week. A few are a little below that level and some are able to stretch to an occasional 40-hour schedule. Order backlogs are reported from 1 to 4 weeks, with the average slightly over 2 weeks. Prospects for the next three months are expressed as uncertain.

Of 43 blast furnaces in the Chi-

CARRIER NATURAL-FREQUENCY CONVEYOR



TAKES HEAT, IMPACT AND ABRASION IN STRIDE!



HERE you see a 15′ Carrier Natural-Frequency Conveyor at work underneath a Pangborn Rotoblast "Continuous-Flo" Barrel in International Harvester's Indianapolis plant. It puts in a rugged 16-hour day conveying 320 tons of hot gray-iron castings, including heavy water-pump housings, flywheels, retaining rings and other engine parts.

Foundry applications are only one of the many uses for Carrier Conveyors. Others include bulk chemicals, cement, ores, mill scale and slag, food products and machine turnings — all of which are now being successfully conveyed and processed by Carrier Natural-Frequency Vibrating Equipment. Write for Bulletin 112. Carrier Conveyor Corporation, 221 North Jackson Street, Louisville 2, Kentucky.

CARRIER CONVEYOR ABOVE HAS FOUR BIG ADVANTAGES OVER PREVIOUS METHOD:

1 Vibration of unit accomplishes far better job of shot removal.

2 Instead of bunching up, castings now move quickly and evenly down conveyor, for easier sorting.

3 Heavy steel-plate trough resists impact, heat and abrasion, making maintenance costs negligible compared to a belt.

4 Patented Carrier Natural-Frequency drive uses heavy coil springs as drive units. Result — low input horsepower, uniformly distributed operating stresses, and a *minimum of mechanical maintenance.*

CARRIER CONVEYOR CORPORATION, LOUISVILLE 2, KENTUCKY

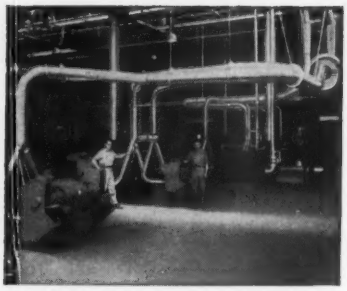
Circle 652 on Page 51

dust and fumes ... no problem

in famous foundries served by

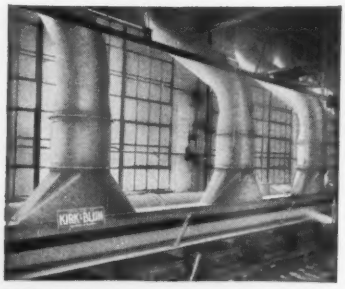
KIRK & BLUM

dust and fume control systems



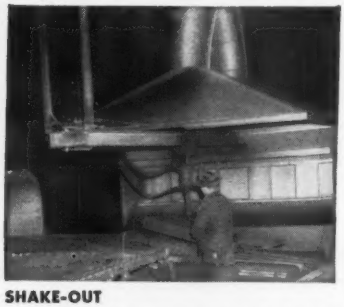
● **GRINDING**

In the chipping and grinding departments, Kirk & Blum systems control dust; dry collection.



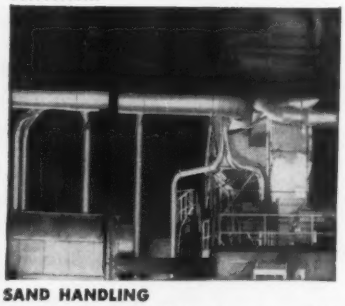
● **POURING**

"Moving Floor" pouring station. Forty-foot-long Kirk & Blum hood effectively removes fumes as they are formed.



● **SHAKE-OUT**

Clean air flows over the shake-out grate, removing dust below the operators' breathing level; wet collection.



● **SAND HANDLING**

Equipment is efficiently exhausted by a Kirk & Blum system; wet collection.

When a "dirty" foundry becomes "clean", important differences soon become apparent in worker efficiency, in maintenance and housekeeping costs, and even in plant-community relations.

If dust or fumes are a problem in your foundry, call on Kirk & Blum for the *complete* job—design, fabrication and installation. From 49 years of experience, Kirk & Blum engineers will be able to show you comparable problems efficiently solved the economical way.

For further details and illustrated booklet, write today to: The Kirk & Blum Manufacturing Company, 3108 Forrer Street, Cincinnati 9, Ohio.

cago district, 31 were operating in mid-December. This was the lowest level since September, 1954, with 30 in blast.

* * *

A memorandum which Herbert J. Weber, director of the Safety, Hygiene and Air Pollution Control Program of the American Foundrymen's Society, sent to all Illinois members of the society early in December is worthy of passing along.

Illinois law requires that any kind of radiographic equipment such as x-ray, betatrons, radioactive isotopes, etc., must be registered with the Illinois Department of Public Health by Jan. 1, 1958, or the owner may be subject to a fine of $1000 and six months in prison for each day of failure to register. The law is all-inclusive and covers not only industrial but medical and first-aid equipment as well.

The Illinois Department of Public Health is located at 400 S. Spring St., Springfield, Ill. Rowland Cross, M.D., is director.

* * *

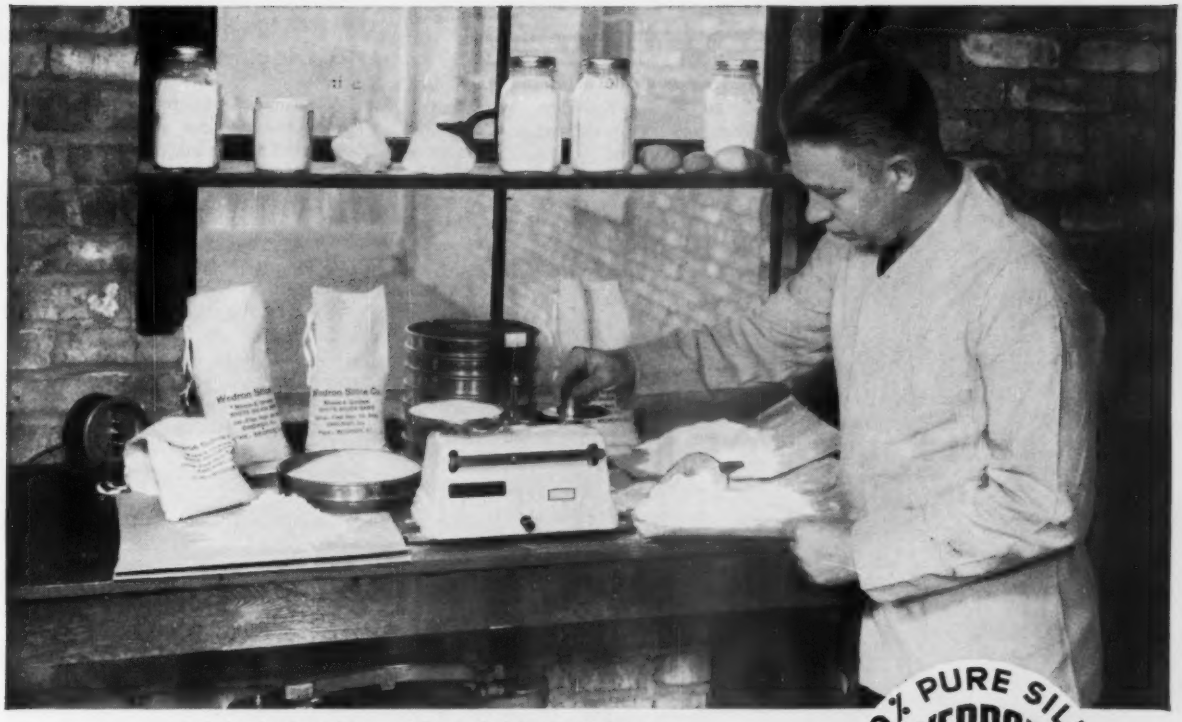
Under new rules drafted by Milwaukee and its metropolitan sewage commissions, home builders may be required to use cast iron instead of terra cotta pipe for sanitary connections to city and village sewer systems. This should be of considerable interest to manufacturers and distributors of cast iron pipe. The two commissions have scheduled a hearing on the proposals at the Milwaukee courthouse at 10 a.m. Jan. 9.

Principal reason for substituting cast iron for terra cotta in future home construction is to reduce the discharge of ground water into sanitary sewers. Ground water in the sanitary sewer system, particularly during long periods of heavy rainfall, creates a problem of treatment at the disposal plant.

It is estimated cast iron connections will cost from $100 to $200 higher for each installation. However, officials point out the increased cost would be amortized over a long period by smaller maintenance costs for home owners. Because cast iron pipe joints are made with poured lead, the expense of keeping tree roots out of connections is eliminated.

Despite the advantages offered by cast iron pipe, sewerage officials fear that opposition to the change in practice will develop because it will increase home building costs.

Pittsburgh— Foundry activity declined steadily in this area during December, influenced partly by the holiday season. Only in isolated cases are foundries reporting strong sales volume. Suppliers to auto-



Each batch of sand is carefully checked in the Wedron laboratory during washing, drying and grading operations.

99.9% PURE SILICA
WEDRON
SILICA COMPANY
INDUSTRIAL SAND

Does Your Casting Operation Require Controlled Quality Sand?

The chances are good that you need far better casting sand now than you did 10 years ago, or even five. Methods have changed and so have sands. Sand nowadays must be graded very carefully by well equipped plants. Inspection and control is highly important in modern sand processing. This takes competence and technical knowledge. You just can't dig it up and ship it.

This is why it pays you to buy your foundry sand from Wedron. We regularly process, as standard, 17 grades for foundry use. Each is a uniform, white, and rounded grain sand, ideal for making high quality castings.

In addition, we offer 7 grades of ground silica flour, each also closely controlled to meet rigid specifications.

Our deposit is the finest raw material—white rounded grain sand from the famous Ottawa-Wedron district. These sands are thoroughly washed, screened, dried, inspected and bagged in our modern plant. They are then delivered to you as the finest foundry sand product available today.

Why not make your next order Wedron? You will be surprised at the increased quality you get for your sand dollars.

NEW SAND BOOKLET

This new booklet gives all the details on Wedron Sands for all kinds of industrial uses. Complete descriptive folder details the Wedron processing operations which produce the finest rounded grain silica sands. 24 separate standard grades are tabulated and chemical analysis of sand is given. Numerous illustrations of the Wedron plant and facilities are shown. Send for your copy today!

WEDRON

MINES AND MILLS IN THE OTTAWA-WEDRON DISTRICT
WEDRON SILICA COMPANY
135 South LaSalle Street, Chicago 3, Illinois

Circle 654 on Page 51

makers say demand is fair, but sales dipped in December. Demand from steel mills has dropped at a greater rate than has steel production.

Merchant pig iron suppliers say little upturn in demand from foundries is expected early in 1958. They add that shipments dropped throughout the fourth quarter to such customers as producers of ingot molds. Sales are not as slack as in 1954, however.

The Pennsylvania State Employment Service announced in late November that factory employment decreased approximately 4400 during October. The major decrease appeared in primary metals, due to "widespread cuts in rolling mill, blast furnace and foundry operations." Producers of metalworking machinery, construction, and mining equipment also reduced their work forces.

Aluminum Co. of America, Pittsburgh, has announced installation in Chicago of a new research facility for fundamental study of the die-casting process. The laboratory will be equipped for full-scale pilot plant operations.

dress your FOUNDRY grinding wheels

When a new wheel is used, sharp abrasive grains are worn dull . . . wheel pores tend to fill with metal . . . grinding efficiency goes down. But you can keep all grinding wheels at top efficiency by dressing them regularly with inexpensive Desmond mechanical dressers.

Desmond Heavy Duty dressers are designed specifically for use on high speed, coarse snagging wheels, where a fast grinding surface is desired. They are the most effective dressers on resinoid and rubber bonded wheels.

Also Desmond Hex and Huntington dressers are widely used in foundries where rough grinding is performed on large and medium size wheels. Write for catalog of our complete line and the name of your nearest distributor.

THE ONLY COMPLETE LINE OF GRINDING WHEEL DRESSERS AND CUTTERS

Desmond

THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Metallurgical Associates Inc. Offers Sales Training Clinics

A series of one-day sales training clinics for casting salesmen will be conducted in all major foundry areas in the country during 1958 by Metallurgical Associates Inc., New York foundry consulting firm. The first clinic is scheduled for Tuesday, Jan. 21, 1958, at the Sheraton Hotel, Philadelphia.

Clinics are open to all foundries and are based on the theme "Techniques of Selling More Castings . . . Profitably!" They will be directed by Harold Brown, vice president of Metallurgical Associates and writer and lecturer on the subject of increasing sales and developing salesmen for foundries.

Classes will be limited to insure personalized instruction and to permit participation by registrants. Instruction will cover the use of proven, effective techniques for selling castings. Instructors will be successful salesmen who will show the principles and techniques which make the difference between a foundry's getting the right order at the right price for its facilities or losing the sale.

Salesmen in attendance also will learn pertinent information on metallurgy, properties, design, pattern equipment, and competitive materials and processes with material prepared under the technical supervision of Prof. Howard F. Taylor, head, Foundry Department, Massachusetts Institute of Technology.

The daily program runs from 9:30 a.m. to 5 p.m. and has been arranged as follows: 9:30 to 11:30 a.m., Product Knowledge; 11:40 a.m. to 12:15 p.m., Finding the Customer; Lunch; 1:30 to 2:30 p.m., Making the Actual Call, Getting the Order, and the Follow-Up; 2:45 to 3:30 p.m., Overcoming Objections; Coffee Break; 3:45 to 4:15 p.m., Turning Complaints into Sales; 4:20 to 5 p.m. Human Relations in Selling

The registration fee of $55 includes working materials and luncheon. Headquarters of Metallurgical Associates are at 30 Rockefeller Plaza, New York 20.

Book Review

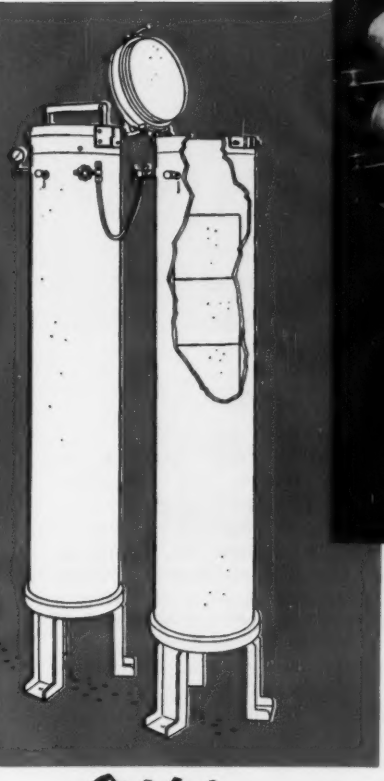
Tested Scientific Inventory Control, by W. Evert Welch, published by Management Publishing Corp., 22 West Putnam Ave., Greenwich, Conn. Price $12.50.

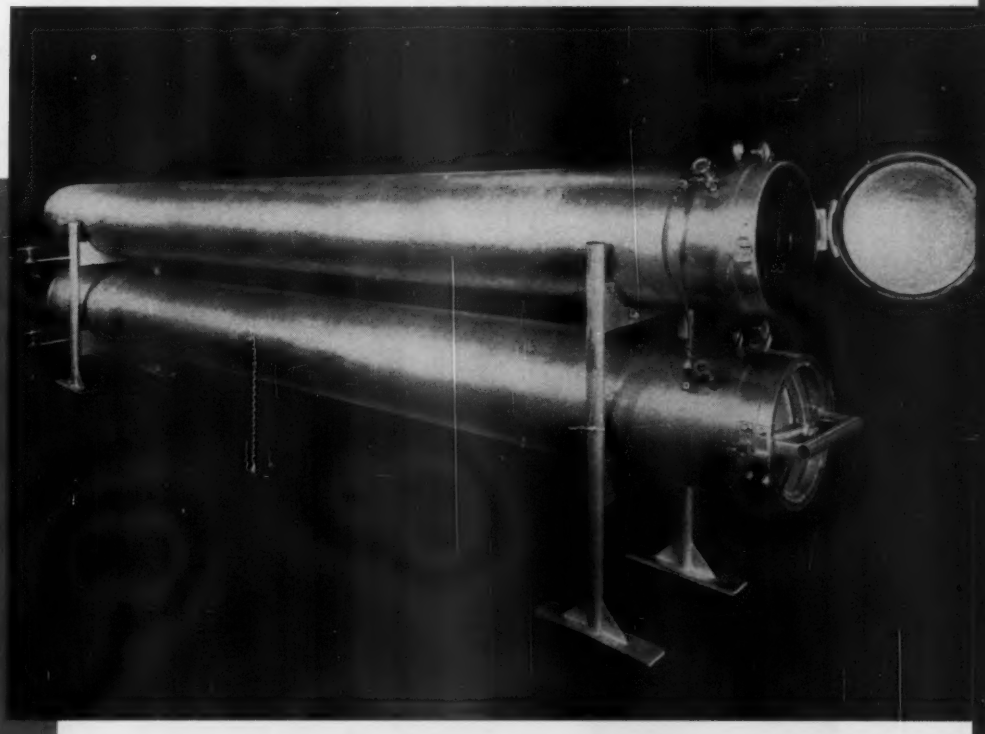
Book provides step-by-step procedures for applying to business the modern methods of inventory control which are being used profitably by progressive firms in many fields. It is written for the operating man.

Circle 655 on Page 51

IN MAKING CORES WITH CO_2...

Carbon Dioxide from DRY ICE CONVERTERS Costs up to 75% LESS!





Thousands of DRY ICE CONVERTERS are in use in other industries using Carbon Dioxide, attesting the very REAL SAVINGS which are realized.

Additional DRY ICE CONVERTER ADVANTAGES

Dry ice converters are A. S. M. E. approved pressure vessels which may be charged with full-sized 50-pound blocks of solid carbon dioxide, commonly called "dry ice". This dry ice converts to gas, and then is drawn off through low-pressure piping to the point of use. Convenient, economical and safe, Dry Ice Converters are available in capacities up to 1000 pounds (equivalent to 8700 cu. ft. of gas). For further information write to . . .

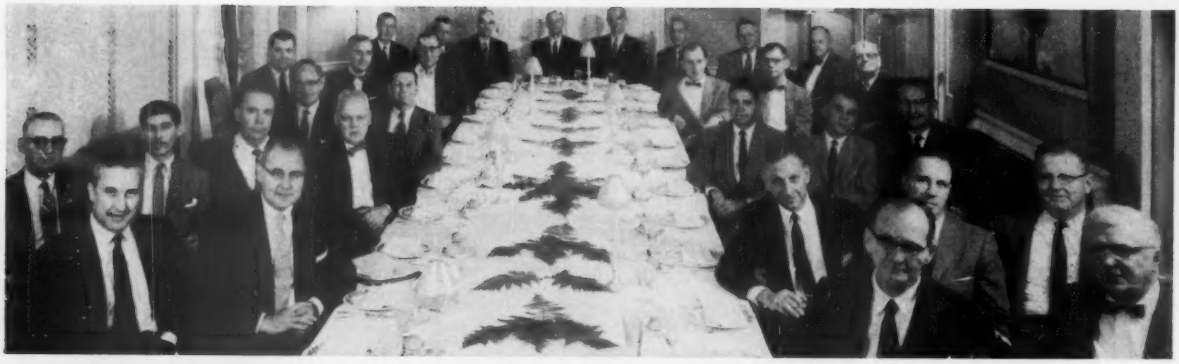
- **Large storage capacity at any convenient location, indoors or out.**
- **Safe! Eliminates hazards of moving gas cylinders in and out of plant.**
- **Minimum Maintenance! No power, no electricity, no refrigeration required.**

DRY ICE CONVERTER CORP.

DEPT. W BOX 1652, TULSA, OKLA.

DRY ICE CONVERTER CORP.
TULSA, OKLAHOMA

Circle 656 on Page 51



Members of the National Foundry Association Administrative Council

ARTHUR G. HALL
President

NFA ANNUAL MEETING

Considers Employee Relations

By FRANK G. STEINEBACH
Editor

R. C. S. POTTER
Vice President

THE 59th annual meeting of the National Foundry Association, held at the Waldorf-Astoria, New York, Nov. 7-8, featured discussion of problems pertaining to employee relations, employee communications, contract negotiations, and public relations.

Arthur G. Hall, Nordberg Mfg. Co., Milwaukee, was elected president of the association; R. C. S. Potter, Chemung Foundry Corp., Elmira, N. Y., was named vice president; W. G. Greenlee, Greenlee Foundry Co., Chicago, was re-elected treasurer, and Charles T. Sheehan was continued as executive secretary.

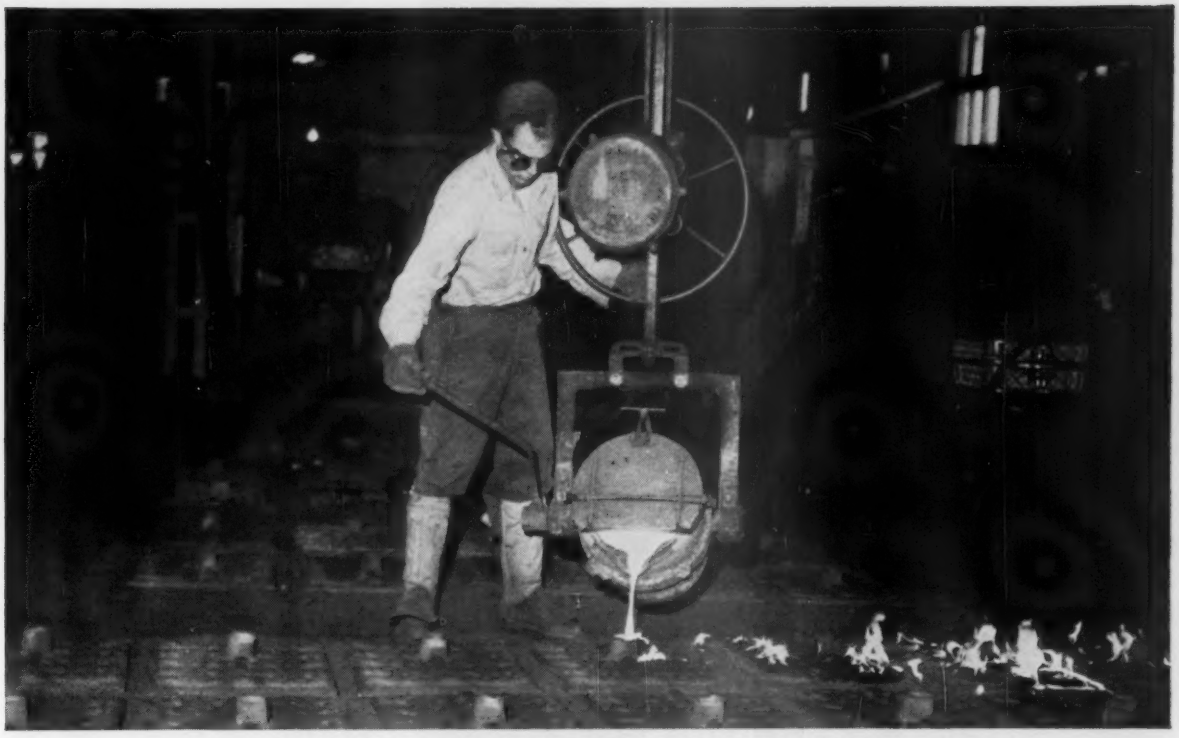
New members of the administrative council for three-year terms are as follows: Nicholas Bartlett, H. W. Clark Co., Mattoon, Ill.; J. E. Gickler, Missouri Steel Castings Co., Joplin, Mo.; G. W. Hannay Jr., Barnett Foundry & Machine Co., Irvington, N. J.; J. P. Keating, Neenah Foundry Co., Neenah, Wis.; A. J. Rumely Jr., LaPorte Foundry Co., LaPorte, Ind.; E. C. Thompson, Ohio Brass Co., Mansfield, Ohio; and H. W. Winterson, Blaw-Knox Co., Pittsburgh.

Thomas W. Pangborn, chairman, Pangborn Corp., Hagerstown, Md., and Frank G. Steinebach, vice president and secretary, Penton Publishing Co., Cleveland, and editor of FOUNDRY, were named honorary members of the association.

Paul L. Arnold, resident manager, United States Pipe & Foundry Co., Decota, Calif., and retiring president of the association, stated that while on Jan. 26, 1958, NFA will complete 60 years of service to the foundry industry in the field of labor-management, the need for this service is greater today than at the time of the founding. He pointed out that NFA is making every effort to accomplish the aim of doing a good job for all foundries, large and small, as unions are doing for their negotiating teams through a well trained but expensive staff of researchers and industrial relations experts.

President Arnold pointed to the increase in the number of companies

Frank G. Steinebach, editor, FOUNDRY, on left, receives honorary membership certificate from Paul L. Arnold, United States Pipe & Foundry Co., and president of NFA



NEW LOOK at Drake foundry. Durez-bonded shells are poured horizontally. Then bedding sand is thrown over the poured shells and another layer is started.

"Tough—but worth it!" says small foundry taking the big step to shell mold castings

Can a progressive small foundry compete with larger ones in the production of shell mold castings?

"Yes!" says the management of Drake Manufacturing Co., Inc., Friendship, N. Y.

Drake, with about 50 employees, was producing 250 tons/month of production and semi-production gray iron castings. In shell molding, Drake managers saw an opportunity to broaden services, boost plant output 40%.

Help—from a customer

Drake men went to see a customer—a company buying production castings requiring close accuracy (±1/64″ on many dimensions, .040″ finishes on most surfaces, and pressure tightness). The castings were to be machined in a highly automated line.

The customer listened as Drake men explained why shell mold castings would increase his machine production by reducing material removal, and give him more uniform castings.

Then he wrote an order for pattern equipment plus a substantial number of castings.

It took about four months, including pattern-making time, for Drake to get into full production of shell mold castings. Initial progress was not smooth. Drake management spent hundreds of hours on the new process. Many tests were run again and again before definite conclusions could be reached.

Help from Durez, too

Through the changeover period, an experienced Durez man was on the job, too. He checked trial castings; adjusted sand-resin ratios; made useful recommendations based on Durez know-how in foundry resins.

Drake men agree their effort is paying off now—in dimensional accuracy of castings, fine surface finish, and low cost over long runs.

Less manpower per mold

An outstanding advantage of shell molding, Drake discovered, is the semi-skilled labor cost. Skilled labor is used only on the pattern—not on the molding floor. Lower costs per mold result.

Semi-skilled operators can make the molds. Nearly one-third of the cores produced at Drake come from two new machines operated by one man *without previous foundry experience.*

Only a few months after first deciding to look at shell molding, Drake management sums up:

"We are pleased with the shell operation at our plant—and most important is the satisfaction of our customers with the castings."

In this successful venture, Drake depends exclusively on Durez foundry resins. You can get results like Drake's, too—accuracy, good surface finish, low cost—when you choose Durez for *your* shell molding resin requirements.

To learn how foundries are using these resins, and to get an idea of the results they enjoy, write us today asking to receive issues of fact-filled "Durez Shell Molding News."

DUREZ® HOOKER CHEMICALS PLASTICS

PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

5501 Walck Road · North Tonawanda, N. Y.

Circle 647 on Page 51

participating in the national survey of fringe benefits, to the growth in association files of labor agreements and labor agreement settlements, to the regional activities of the organization, and to activities in the field of health and safety.

James I. Poole, Fairchild, Foley & Sammond, Milwaukee, emphasized that productivity or automation, whichever it may be called in a particular foundry, is the only basis by which the employer can grant a real wage increase beyond the amount absorbed through inflation. He stated that predictions point to a continuation of inflation in 1958. In summary, he indicated that the 1958 goals of foundry unions are for the most part traditional, but the asking price looks to be substantially higher than usual.

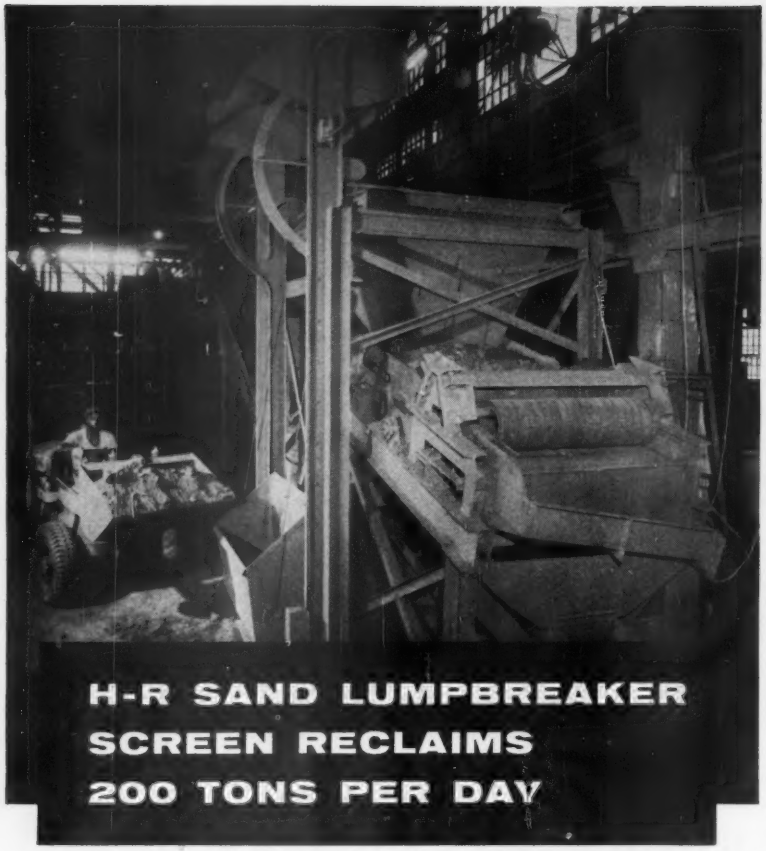
Communications Are Vital

In speaking on "Developing Effective Employee Communication," Dr. Paul J. Mundie, Humber, Mundie & McClary, Milwaukee, emphasized that many companies have totally inadequate communications between the board of directors, the president, and top management groups. Unless this is corrected, proper communication with workers seems to be impossible. He charged that heads of companies must take a close look at the techniques which are being used for communicating at the higher levels. Better communications must start at the top and then work down.

Dr. Mundie pointed out that a company's operation is the reflection of top management, its ability, its planning, its teamwork. It is the men hired to run a company that make the company great. If top management will think together, work together, and plan together, it will be reflected in the success of a company.

Perhaps the highlight of the meeting was the presentation of a skit, requiring both morning and afternoon sessions, on "The Eneff Ay Foundry Co. Prepares for Negotiations." Participants included Herman Menck, vice president in charge of manufacturing, Harnischfeger Corp., Milwaukee; C. A. Carolin, president, R. B. Carolin Foundry & Machine Co., Detroit; J. D. McGill Jr., assistant to resident manager, U. S. Pipe & Foundry Co., North Birmingham, Ala.; Andrew E. Jencks, treasurer, J. S. White Co., Pawtucket, R. I.; Martin J. Ewald, regional counsel, National Foundry Association, Detroit; D. Russell Gochnour, Cheshire, Conn.; and Eugene F. Schlickman, director, industrial relations research, NFA, Chicago.

Included with the skit were "do's and don'ts in collective bargaining" and a suggested contract, which, it



H-R SAND LUMPBREAKER SCREEN RECLAIMS 200 TONS PER DAY

Franklin Balmar Corporation in Baltimore salvages 30 tons of foundry sand an hour on this equipment. A vital Hewitt-Robins part of the installation is a Gyrex lumpbreaker screen, which draws hot sand and refuse from the hopper at a controlled rate. Ring-type breakers crush only the molding sand lumps; cores and large metallic refuse are carried over the screen and ejected on an integral vibrating side discharge chute. Crushed sand flows through the screen onto an H-R conveyor equipped with Maltese Cross fibre glass hot materials belting and one-shot lubrication ball bearing idlers. The conveyor has a magnetic head drive pulley which removes fine refuse and discharges clean, aerated, and partially cooled sand.

For Franklin Balmar, this unit assures low running cost, no down-time, and trouble-free sand processing over the years. No mechanical maintenance on screen or original fibre glass belt has been needed in over four years. To find out how H-R products and services can help you, consult your classified telephone directory for the nearest H-R representative, or contact Hewitt-Robins, Stamford, Connecticut.

HR HEWITT-ROBINS

CONVEYOR BELTING AND IDLERS . . . POWER TRANSMISSION DRIVES
INDUSTRIAL HOSE . . . VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

HERE'S WHAT A NEW LOW COST CB10C FLEXIBLO CAN DO FOR YOU

SAVE on initial cost

Not only does the new Patented CB10C cost less than other machines of its capacity, but it handles all types of core boxes, open, horizontally split, or vertically split . . . can replace several single-purpose machines. High capacity side clamp unit is installed in seconds.

SAVE on operating cost

Actually uses less air per cycle. Automatic sequence control and push-button operation means faster operation too.

SAVE on core box cost

The new CB10C handles wood or metal core boxes. Normally the same unvented wooden core boxes used for manual coremaking can be used on the Flexiblo without modification.

SAVE on coremaking labor

One man and a CB10C can surpass the production of several manual coremakers even working with unvented wooden boxes.

SAVE on machine maintenance

This Flexiblo's clean rugged construction and simple all pneumatic circuit means far less maintenance . . . less costly downtime. Single air line is only connection to the machine.

SAVE on box maintenance

The Flexiblo's new air-on-oil, super smooth clamping action is far easier on boxes . . . pounding or blow-by are eliminated. The Flexiblo's exclusive blow action cuts box wear too . . . even when wooden boxes are used.

ONE OF THE NEW FLEXIBLOS guaranteed to blow any core box, wood or metal, that can be blown on any machine, using the same core sand and to blow cores harder, faster and with less wear on core box face or joint and cavity.

PROGRESSIVE FOUNDRIES LOOK TO
BEARDSLEY & PIPER
FOREMOST DEVELOPER OF FOUNDRY MACHINERY
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introducing the new
DIAMOND ALLOY
super alloy tips and liners

FOR SANDSLINGERS • FOR HYDRA-SLINGERS • FOR SPEEDSLINGERS

NEW HIGH IMPACT STRENGTH

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NEW HEAT TREAT

GUARANTEED BY THE MANUFACTURER OF YOUR SLINGER
to provide lowest ramming cost per ton of sand rammed
to provide superior performance under toughest conditions
to appreciably reduce downtime

Write now for prices and information
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was pointed out, was not a model but one that presents much good information.

Dilman M. K. Smith, vice president, Opinion Research Corp., Princeton, N. J., spoke at the final luncheon on "How Public Opinion Affects Management." Mr. Smith pointed out that business leadership's competitive problem is different today than it has been in the past. Leaders now compete with other companies on the price and quality of products and for distribution, but they also have leadership competition for a public following. With the rise of the labor union and extension of political power, people have a choice of leadership. If they don't like what industry is doing, they give their support to the labor union or to the politician. Labor leaders, too, are having their troubles. Leadership is judged day by day in terms of two factors: 1. How well it performs; 2. How well it interprets its performance.

Mr. Smith pointed out that in the struggle for a public following, favor is not won by doing good deeds alone. Industry must do good deeds, render good and faithful service, but continually interpret that service. He cited as an example the company that grants a pension but doesn't interpret it to its employees. A second communication principle stems from the fact that when a company sells anything, it is the rule to find the interest, need, want, desire, and then show how the product or the leadership will satisfy that need. On the product side, this rule is used daily, but on the institutional side, it all too frequently is forgotten.

Booklet Provides Noise and Hearing Protection Data

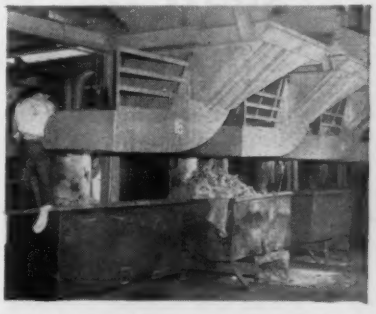
Third in a series of three booklets on industrial hearing conservation, designed for management level personnel, has been published by the accident prevention department, Employers Mutuals of Wausau. Based on the experience of the company's noise specialists, it places special emphasis on techniques for persuading employees to wear ear protective devices through use of educational and psychological methods. The booklet provides information for physicians, nurses, and others who may be involved in industrial hearing protection.

Although published primarily for Employers Mutuals policyholders, single copies of the booklet are available free to those requesting it on their business letterhead. Address: Publications Editor, Accident Prevention Dept., Employers Mutuals of Wausau, Wausau, Wis.

Circle 660 on Page 51→

1. Castings come from heat treat to receiving station in furnace trays which are dumped automatically. An inclined conveyor then raises castings to upper level sorting belt.

2. Castings are picked from sorting belt and dropped into segregating hoppers. Any castings missed as they pass their particular segregating stations are recirculated back past the stations automatically. This system is very flexible, since many different castings can be sorted; or the same volume, but with only a few different castings, may be sorted.



3. The sorted castings are carried by gravity from the segregating hoppers to a convenient work level at the grinders. After grinding they are dropped into dump hoppers for distribution.

Overhead Sorting and Grinding System . . .

Engineered by PLANET...

Saves Foundry Time, Labor and Space

This overhead sorting and grinding system was recently designed, engineered and installed by the Planet Corporation.

In operation only a short time at a large midwest malleable iron foundry, it has already proven it will increase production and reduce labor costs.

You can increase the efficiency of your plant with Planet foundry automation. Whatever your specific problem may be, Planet foundry specialists can solve it in a way that will cut your costs. For further information, with no obligation, write or phone today.

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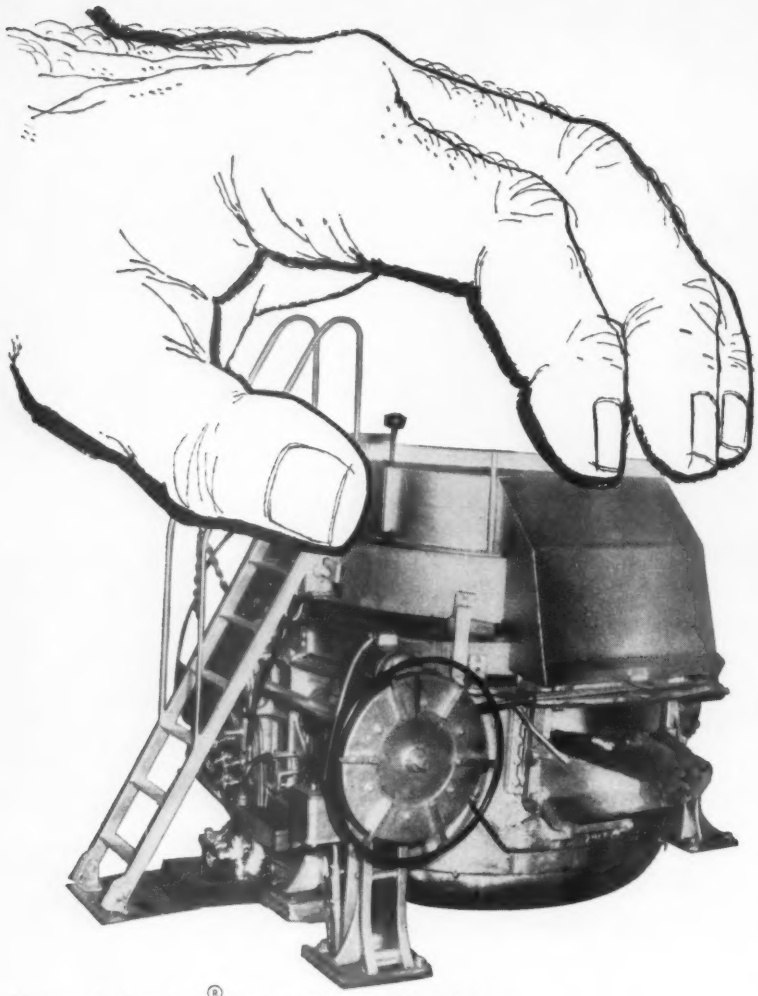

Wheelabrator® Dustube Collectors

snuff out the fume problems on 38 electric furnaces

Collection efficiencies meet the stringent requirements of all smoke control boards.

When you need a collector you can be *sure* will meet requirements of your local smoke abatement board, consider these factors: More experience in solving Electric Furnace Fume problems is available at Wheelabrator than anywhere else . . . twenty-six plants are now ventilating 38 furnaces with Wheelabrator Collectors. For instance, at Dodge Steel Company, Philadelphia, a Wheelabrator collector entirely eliminates the fume from two acid electric furnaces pouring up to 8,400 lbs. of steel. It thus gained the approval of the Philadelphia Air Pollution Control Division.

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505 South Byrkit Street, Mishawaka, Indiana

Meditations of a Sandman

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Transition"

ONE need not visit many foundries to learn that we are still a long way from the universal adoption of synthetic sand practice. The oldtimer, long familiar with nature's coated grain, is loathe to change to ways that are new and strange to him. He feels that "'tis better to bear the ills he has, than fly to those he knows not of."

I have little doubt that eventually all molding sand—whether the grain be coated or uncoated—will be mulled to order or, as Frank Brewster would say, "formulated!" But until that day arrives, hundreds of foundrymen each day will continue, in the ways of their predecessors, to scatter a small amount of new naturally bonded sand over the shakeout, moisten, cut it over with a shovel, then screen or aerate this conglomerate mass into a heap or windrow.

A man must be optimistic indeed to suggest that such treatment results in a uniformly blended molding material. Surely neither clay nor water receives the desired "spread," and the word "control" has little meaning. Success in such a practice depends almost wholly on the experienced feel of the sandmixer, and this feel in turn can be affected by his emotional outlook. A breakfast argument with his wife could spell ruin for much of that day's production of sand.

Some Excellent Castings—Yet, despite the drawbacks of ancient practice, I must admit freely that many tons of excellent castings are produced daily in this way. I am reminded of a local nonferrous shop which turns out thousands of bronze plaques, large and small, of a quality that defies criticism. This foundry has been in business nearly 100 years, and in many respects there has been little change in its plaque molding method during that time. It still is a matter of wooden flasks, hand

The number of full-time foundry teachers in FEF accredited engineering colleges has increased 400% in the last nine years.

The accompanying chart proves that foundrymen's interest in this subject is moving mountains . . . in the direction of a better industry.

It's up to you, literally, to keep up the momentum.

INSTRUCTION STAFFS – FOUNDRY PROFESSORS

Write for booklet "Let's Look Ahead".

You'll be glad you did.

Foundry Educational Foundation

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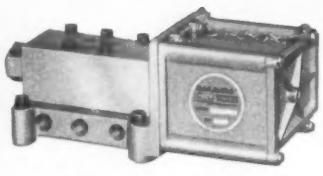
Quick-As-Wink®
AIR AND HYDRAULIC
Control Valves



¼" "O"-Type Single Solenoid 4-way Valve.

½" "B"-Type Lever Operated 4-way Valve.

Play safe. Install Quick-As-Wink valves on **all** your air and hydraulic controls. Positive and fast acting, all operating parts are in pressure balance, avoiding any tendency to creep or crawl. You'll get month after month and year after year of long, dependable, trouble-free — **and safe** — service. There's nothing better than a Quick-As-Wink Control Valve. Can you afford to gamble with less? Sizes from ¼" to 4". Hand, foot, cam, pilot, diaphragm or solenoid operated. Thousands of different types, sizes and actions. Get full details.

Write for **BULLETIN NO. 571** *Today.*

Quick-As-Wink®
AIR AND HYDRAULIC
Control Valves

Mfd. by **C. B. HUNT & SON, INC.,** *1974 East Pershing St., Salem, Ohio*
—Engineering and Sales Representatives in the Principal Cities—

ramming, print-back, and "tricks."

I do not know what the company's percentage of loss is, but I would venture to guess that manhour production is extremely low. Of course the plaques are specialty work and are priced accordingly; and competition in the field is negligible.

Most foundrymen recognize the need for greater control over sand properties, but dread the transition from a naturally bonded to a *formulated* practice. Aside from the need for mullers, aerators, and additional sand-handling equipment, there is the frightening prospect of not being able to adjust to a new material. We were once told that in turning to a synthetic practice, we had to discard all our old sand and start with completely new material. This warning has been proved sheer nonsense.

I know of at least a dozen shops, including our own, which made the change simply by discontinuing naturally bonded sand and substituting a desired grade of clayfree material. By small additions of bentonite and other additives, intensive mulling, and moisture study, we soon produced a sand that excelled anything we had known previously. Because our base material was predominantly the old naturally bonded sand, we termed our new mix "semisynthetic," which may or may not be a misnomer.

Over the months, our new silica additions gradually gave us an increase in permeability, and we were able to work at a much lower level of moisture. The feel of the sand changed perceptibly. At first there was bitter complaint from the molders; but this problem proved to be a passing phase, and soon they even were praising the behavior of the changing mix.

Sand Additions — Some foundries, which suffer excessive buildup of burned core sand, have found it advisable to add a small amount of naturally bonded sand to each muller batch to maintain a desirable amount of fines, widen the moisture range, and improve moldability.

Some fire clay producers claim that comparable results can be obtained by substituting fireclay for a major portion of the bentonite generally used. They argue that although moisture must be increased slightly, and permeability will be somewhat lower, the safety factor in both moisture range and expansion will be improved, and the mold wall will have greater stability. In other words, one gains some of the benefits of a naturally bonded sand without the disadvantages.

I am in no position to support or refute the validity of the claims, for I have made no significant experiments with fireclay for many years.

Circle 663 on Page 51

NEW CarVer RAPID MULLER

Patented, self-cleaning mixing arm, with replaceable, wear-resistant NiHard end pieces.

FAST! A BATCH EVERY 76 SECONDS!

Not only does this revolutionary new machine mix core sand *fast* . . . the mulling action is so thorough that you *save up to 30% in binder!* Each grain of sand receives an equal coating of binder, so that the finished mix is absolutely free from lumps or wet spots!

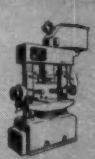
No more cleaning or maintenance problems! The new Carver Rapid Muller mixing arm does most of the cleaning itself. And it's easy to reach inside and clean, without awkward wheels and paddles to get in the way. Maintenance? There is only *one* moving part . . . *eliminating wear and costly repairs.* You can *rely* on the Carver Rapid Muller because of its *extreme simplicity* in design. Takes up only 7 square feet of floor space — *the most compact muller on the market!*

Most important, your initial investment in the Carver Rapid Muller is *two or three times lower* than most other makes!

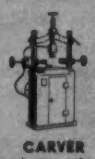
COMPARE CARVER WITH ANY OTHER MULLER -- RIGHT IN YOUR OWN FOUNDRY! Carver will place its Rapid Muller alongside *any* other muller and let its performance speak for itself. *You be the judge* — and let the best muller win!

WRITE OR CALL TODAY FOR COMPLETE DETAILS

Only CarVer Has Everything For the CO_2 Process!



CARVER V & S Core Shooters



CARVER Automatic Gassing Apparatus

KRAUSS Core Vents

STEINEX available only from CARVER

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RUSH information on new Carver RAPID MULLER and FREE DEMONSTRATION!

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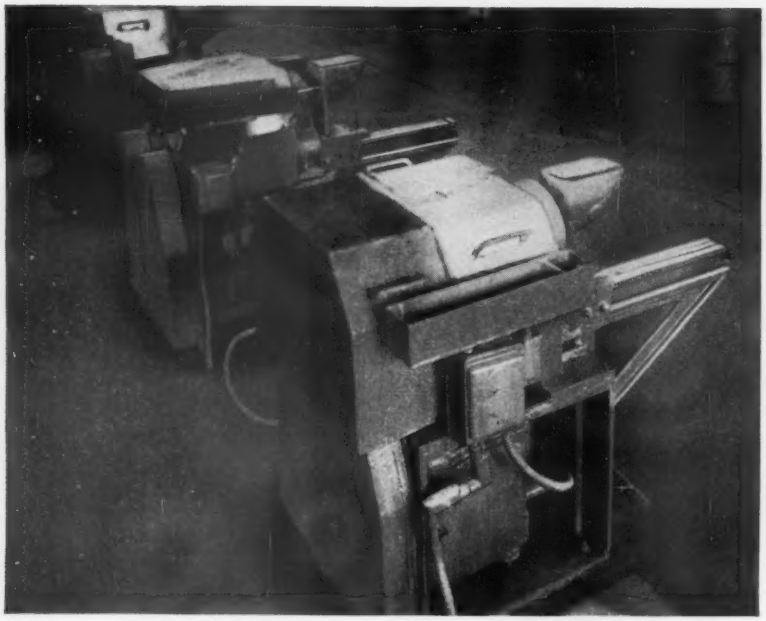
Circle 664 on Page 51



Centrifugal casting machines for casting piston rings at Koppers Co. foundry, Baltimore, Md. Shamva Mullite SM-100 is used to coat the centrifugal molds for these machines to achieve good surface finish.

KOPPERS CO. REPORTS "EXCELLENT RESULTS"

WITH SHAMVA MULLITE SM-100 CORE WASH

At the Koppers Co. foundry, in Baltimore, Md., Shamva Mullite SM-100 core wash delivers "excellent results." In this plant, Shamva Mullite SM-100 is used to coat centrifugal molds in which are cast all kinds of metal. Here are five reasons why SM-100 is ideally suited to the operation:

1. Good surface finish
2. Doesn't settle out of suspension
3. Easily applied with brush or spray
4. Cuts machining costs
5. Prevents mold sticking

SHAMVA MULLITE SM-100 is shipped dry in 90 lb. bags. For complete details, contact your local Shamva Mullite representative. He's in the Yellow Pages under "Refractories." Or write to *Mullite Works, Refractories Division, H. K. Porter Company, Inc., Shelton, Conn. In Canada, H. K. Porter Company (Canada) Ltd., Guelph, Ontario.*

H. K. PORTER COMPANY, INC.
REFRACTORIES DIVISION

I do, however, retain the memory of one experience which might have some bearing on the subject. This event occurred about 1942 when we were still in the screen, shovel, and windrow stage, and our molding sand was of the San Francisco naturally bonded material.

On one floor, where crankcases were being made in dry sand, it was considered necessary to add 1 ton of new naturally bonded sand every other day. This amounted to 3 tons a week, and of course 3 tons of old sand had to be hauled away from the floor on alternate days. We estimated conservatively that we were spending $12 a day to rebond this floor.

On advice that seemed worth heeding, we discontinued the new-sand additions; instead, we scattered 100 pounds of fireclay over the shakeout each night. At that time, fireclay was selling at 50 cents per 100 pounds. Because hardly more than five minutes of labor was required for this chore, we thus enjoyed a saving of $11.50 a day, in addition to having better sand. The small amount of new sand required was clayfree and was mulled into the dry-sand facing. This addition replaced the loss of sand carried out on the castings, and practically no sand had to be carted out.

From this satisfactory experience, we turned to fireclay as a rebond for all of the backing sand in the shop. At one time we were consuming 2500 lb of this material each day. This practice was discontinued after the installation of a large muller and the purchase of front-end loaders. We decided then, since we were mulling all sand, to use bentonite.

The Pros and Cons—Whether this decision was wise is a debatable matter. It might be argued that from two to three times the amount of fireclay is required to produce a green strength comparable to that provided by a given amount of western bentonite, and that permeability will be reduced accordingly. Is it not likely, however, that once the clay saturation point has been reached, the fireclay requirement might not exceed that of bentonite? The sand thus treated certainly should be more flowable and less prone to penetration or moldwall movement. And if moisture is held close to optimum, why do we need the extra permeability?

As usual, I am asking questions—not reaching conclusions. I have no financial interest in any of the mold materials currently sold, nor do I have any quarrel with the producers or their sales agents. My interest is confined strictly to the more economical production of better castings;

since the effective use of mold materials plays a dominant part in such a program, our knowledge of these materials should be much more reliable if we are to enjoy the possible fruits of our labors.

Laboratory reports on bentonites and other clays are convincingly important, and most of us know what to expect when a single clay is used under reasonably controlled conditions. But there undoubtedly are significant benefits to be derived from a more prudent pattern of blending, not only of clays, but also of other additives. If ½ pound of soda ash can effectively alter the behavior of 2000 lb of sand, is it not reasonable to believe that there are other mold materials which are potentially capable of serving us better?

A Matter of Choice—Despite the value of laboratory reports, and the experiences of others, in the final analysis each foundryman must determine for himself which materials and methods best serve his practice. Where molding equipment and other considerations differ widely, it would be folly even to attempt to arrive at a universal standard procedure. Even the water and climate must be duly considered in any attempt at effective sand control.

The conscientious sandman loses no opportunity to benefit from the experience of others, for he recognizes his own limitations. Yet to him the real value of a technical article often is to be found in its *implications* rather than in its expressed formulas. He and the author may see eye to eye regarding the nature of the problem to be solved, but they are likely to take different roads to arrive at the solution.

Engineering Education Group Will Meet in Ann Arbor

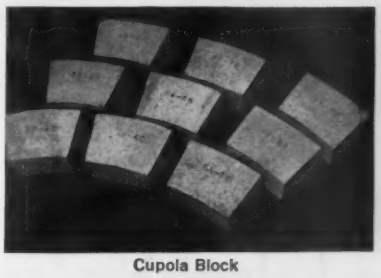
"New Concepts in the Education and Development of Technical Power" will be the theme of the 1958 College-Industry Conference of the American Society for Engineering Education, to be held Jan. 30-31 at the University of Michigan, Ann Arbor, Mich.

Four speakers will present new concepts arising from current research, and four others will describe programs designed by their companies to use "New Concepts of Professional Development."

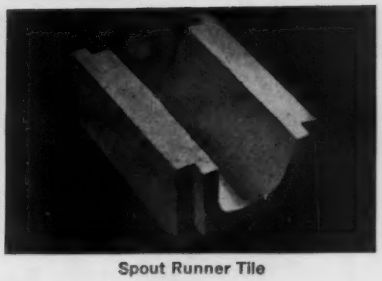
Registration will be held from 8:30 to 10 a.m., Jan. 30, and adjournment is scheduled for 2 p.m., Jan. 31. For additional information, write to the University of Michigan College of Engineering, 255 West Engineering Building, Ann Arbor, Mich.

Laclede-Christy Slag and Breast Block

Laclede Slagtite



Cupola Block



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Foundry Statistics

ALUMINUM

(Shipments of castings—1000 pounds[1])

	Shipments				
	Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1955	827,162	165,482	298,349	355,203	.....
1956					
Sept.	61,942	12,367	17,855	31,649	111,785
9 mo.	585,257	129,628	183,071	261,560	.....
Oct.	73,415	14,402	21,120	37,792	110,818
Nov.	69,058	14,346	20,673	33,938	113,356
Dec.	66,951	13,405	20,557	32,940	118,185
Total	794,581	171,181	245,421	376,230	.....
1957					
Jan.	72,999	14,201	20,963	37,194	116,088
Feb.	69,451	13,366	21,707	34,311	107,869
Mar.	74,527	13,914	22,974	37,521	107,963
Apr.	68,284	14,287	20,376	33,493	98,113
May	65,108	12,705	20,708	31,602	94,748
June	58,547	11,585	17,180	29,700	88,086
July	52,173	10,447	16,322	25,339	89,430
Aug.	55,735	10,996	18,398	26,319	89,826
Sept.	58,692	11,367	17,820	24,900	93,720
9 mo.	575,516	112,868	176,448	280,379	.....

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled
	Total	For Sale	Total	For Sale	Total	For Sale	Orders[1]
1955	1,104,775	652,552	.....	.....	.....	.....	.....
1956							
Sept.	69,380	41,902	59,071	35,534	10,309	6,368	92,553
9 mo.	711,271	415,170	611,962	346,060	99,309	56,392	.....
Oct.	81,528	50,219	68,769	43,109	12,759	7,110	92,734
Nov.	82,717	47,979	68,549	40,107	14,168	7,872	89,977
Dec.	76,352	44,268	63,625	37,569	12,727	6,699	92,311
Total	951,868	557,636	812,905	466,845	138,963	78,073	.....
1957							
Jan.	85,977	51,508	71,689	43,401	14,288	8,107	93,886
Feb.	78,028	46,729	65,411	39,590	12,617	7,139	90,725
Mar.	78,013	48,311	64,560	23,915	13,453	7,666	89,431
Apr.	80,271	51,320	65,990	42,810	14,281	8,510	83,116
May	76,504	46,277	63,058	38,072	13,445	8,205	79,787
June	72,556	44,639	59,829	36,892	12,727	7,747	76,331
July	57,748	34,876	45,101	27,290	12,648	7,586	80,694
Aug.	65,426	39,644	55,320	33,781	10,106	5,863	84,876
Sept.	62,457	38,397	52,281	31,658	10,176	6,739	83,385
9 mo.	656,980	401,701	543,239	317,409	113,741	67,462	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1955	1,008,998	905,867	63,111	.....
1956				
Sept.	72,109	64,887	3,930	56,990
9 mo.	747,194	670,526	45,535	.....
Oct.	81,049	73,058	4,104	54,363
Nov.	72,866	65,022	4,114	52,643
Dec.	65,197	57,931	3,769	56,556
Total	966,306	866,545	57,522	.....
1957				
Jan.	82,025	73,202	4,510	57,422
Feb.	72,084	64,346	4,188	54,133
Mar.	77,418	69,258	4,445	49,135
Apr.	77,167	69,141	4,316	48,148
May	75,347	67,251	4,421	46,791
June	70,959	63,910	3,590	44,232
July	60,621	54,847	3,010	44,175
Aug.	71,233	64,953	3,278	40,446
Sept.	70,804	64,470	3,243	40,298
9 mo.	657,658	590,378	35,001	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled
	Total	For Sale	Orders[2]
1955	27,854	25,294	....
1956			
Sept.	3,079	2,863	8,193
9 mo.	27,040	25,866	....
Oct.	3,442	3,187	7,893
Nov.	2,892	2,715	7,984
Dec.	2,794	2,612	7,616
Total	36,168	33,580	....
1957			
Jan.	3,207	3,017	8,245
Feb.	2,661	2,473	8,276
Mar.	2,970	2,804	7,690
Apr.	2,896	2,723	7,542
May	2,832	2,706	7,188
June	2,973	2,817	6,765
July	2,544	2,384	6,964
Aug.	2,315	2,150	6,222
Sept.	2,279	2,071	5,705
9 mo.	24,677	23,145	....

PRODUCTION WORKERS

Estimated Number

	Aug. 1957	July 1957	Aug. 1956
Ferrous	193,200	193,100	206,700
Nonferrous	62,500	61,500	63,200

Average Weekly Earnings

Gray Iron	84.37	85.63	83.84
Malleable Iron	83.33	83.85	82.80
Steel	95.91	95.24	92.99
Nonferrous	91.83	91.77	89.57

Average Weekly Hours

Gray Iron	38.7	39.1	40.7
Malleable Iron	38.4	39.0	40.0
Steel	40.3	40.7	41.7
Nonferrous	40.1	39.9	40.9

Source: Bureau of Labor Statistics.

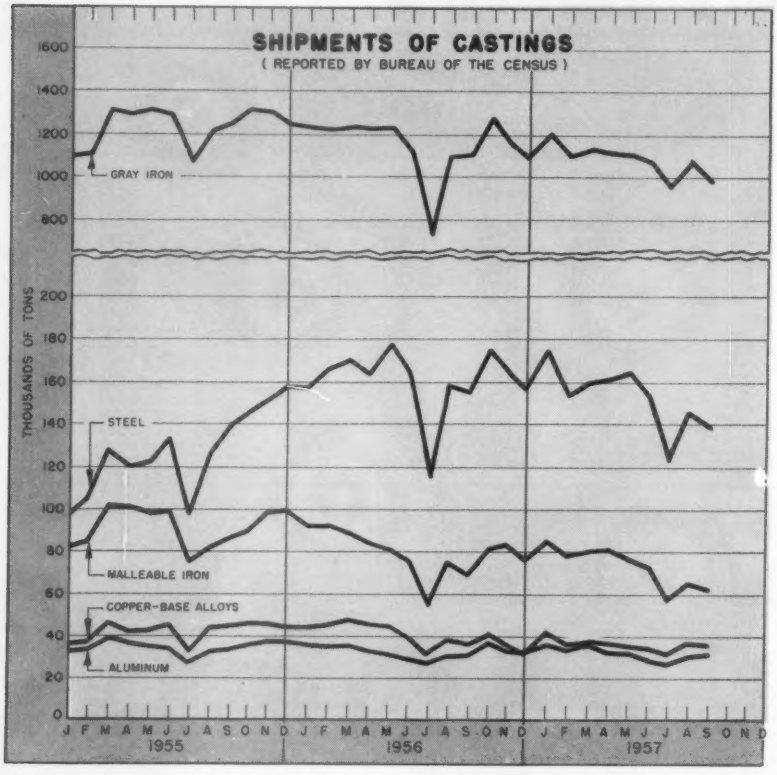
GRAY IRON CASTINGS—SHIPMENTS (Net tons[1])

	All Castings		Miscellaneous Castings		Nodular Iron Castings	Heavy Steel Ingot Molds	Chilled Railroad Car Wheels	Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled
	Total	For Sale	Total	For Sale	Total	Total	Total	Total[3]	Total[3]	Orders[2]
1955	14,837,745	7,987,205	9,161,685	3,715,963	.....	2,739,864	385,041	1,681,630	869,558	.....
1956										
Sept.	1,109,943	648,784	623,743	282,824	.....	233,823	35,361	151,081	65,935	1,037,283
9 mo.	10,301,228	6,006,849	6,114,229	2,734,201	.....	1,865,978	321,487	1,366,929	632,605	.....
Oct.	1,274,734	734,384	749,200	331,069	.....	252,203	30,978	171,377	70,976	996,351
Nov.	1,175,572	634,856	720,263	303,938	.....	251,262	27,852	116,157	60,038	916,723
Dec.	1,108,993	587,046	681,834	281,527	.....	254,703	25,874	92,439	54,143	920,034
Total	13,860,527	7,963,135	8,265,526	3,650,735	.....	2,824,146	406,191	1,746,902	817,762	.....
1957										
Jan.	1,213,215	642,317	761,697	320,058	.....	261,961	31,139	101,069	57,346	904,860
Feb.	1,103,118	582,010	705,585	302,514	.....	230,126	30,079	89,146	48,182	931,054
Mar.	1,133,146	604,481	713,767	305,104	.....	214,775	36,995	108,158	59,451	934,847
Apr.	1,120,349	611,443	699,395	298,319	.....	192,199	36,979	125,710	63,066	899,074
May	1,112,096	625,496	674,460	291,557	11,206	192,336	34,406	141,685	69,209	879,825
June	1,058,464	599,494	630,513	274,115	10,207	193,640	32,087	131,360	70,864	853,012
July	974,102	523,489	565,897	243,187	10,901	190,434	31,209	106,532	60,030	879,976
Aug.	1,075,957	596,779	630,130	265,185	10,339	205,655	28,976	238,209	72,987	825,676
Sept.	990,139	563,477	579,444	259,649	10,253	202,911	23,681	119,689	64,411	805,301
9 mo.	9,760,586	5,348,986	5,960,888	2,559,688	.....	1,884,037	285,551	1,164,558	565,546	.....

STEEL CASTINGS—SHIPMENTS (Net Tons[1])

	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[1]
1955	1,530,694	1,166,706	236,880	1,088,489	814,258	219,602	445,769	354,452	17,278	.....
1956										
Sept.	155,046	121,705	33,496	116,905	91,266	31,314	38,141	30,439	2,182	562,937
9 mo.	1,433,518	1,124,023	272,792	1,051,980	832,145	223,685	363,538	291,878	18,007	.....
Oct.	175,630	135,798	34,762	132,250	101,961	32,743	43,380	33,837	2,019	558,478
Nov.	164,114	126,900	28,284	122,212	93,262	26,436	41,902	33,638	1,848	545,862
Dec.	158,725	125,569	34,080	120,326	94,741	32,227	38,399	30,828	1,853	521,782
Total	1,931,987	1,512,290	368,918	1,444,768	1,122,109	345,091	487,219	390,181	23,827	.....
1957										
Jan.	169,240	133,826	30,090	125,389	98,533	27,739	43,851	35,293	2,351	519,575
Feb.	154,932	121,667	27,181	114,805	89,480	25,060	40,127	32,187	2,121	511,806
Mar.	160,054	124,416	29,968	121,089	93,466	27,683	38,965	30,950	2,285	503,407
Apr.	162,498	124,549	29,708	122,894	93,512	27,624	39,604	32,037	2,084	497,632
May	164,575	125,431	32,840	124,840	94,635	30,926	39,735	30,796	1,914	504,990
June	153,647	119,353	31,338	116,759	91,009	28,766	36,888	28,344	2,572	494,267
July	122,018	90,037	22,803	91,730	67,719	21,426	30,288	22,318	1,377	489,390
Aug.	145,926	111,080	33,641	113,167	86,407	31,639	32,759	24,673	2,002	471,190
Sept.	139,002	105,611	29,718	106,261	80,871	27,855	32,741	24,737	1,863	438,510
9 mo.	1,371,892	1,055,970	267,287	1,036,934	795,632	248,718	334,958	261,335	18,569	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.



COKE PRODUCTION AND CONSUMPTION

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1955	75,150,247	76,266,385	3,154,052
1956			
Sept.	6,453,229	6,609,309	211,015
9 mo.	54,251,682	52,361,486	2,138,153
Oct.	6,742,483	6,951,386	253,147
Nov.	6,328,272	6,681,074	237,330
Dec.	6,615,935	6,959,900	224,452
Total	73,938,372	72,953,846	2,853,082
1957			
Jan.	6,857,640	7,096,024	241,014
Feb.	6,211,845	6,302,583	228,569
Mar.	6,894,121	6,803,311	232,266
Apr.	6,436,273	6,396,900	226,698
May	6,632,519	6,521,817	219,675
June	6,362,335	6,318,339	188,487
July	6,501,266	5,888,057	180,014
Aug.	6,518,060	6,400,036	206,907
Sept.	6,296,653	6,191,238	199,974
9 mo.	58,710,712	57,918,305	1,923,604

INGOT BRASS AND BRONZE

(Shipments in net tons)

	1956	1957
Jan.	27,736	25,681
Feb.	24,949	20,769
Mar.	28,310	21,948
Apr.	25,808	23,507
May	23,437	22,037
June	18,842	18,888
July	17,364	16,695
Aug.	23,812	19,654
Sept.	20,929	19,670
Oct.	23,045	22,800
Nov.	21,818	.....
Dec.	18,046	.....
Total for year	274,096	.....

Source: Defense Council of the Ingot Brass and Bronze Industry.

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments Total	Shipments For Sale	Unfilled Orders[2]
1955	778,000	493,244	.....
1956			
Sept.	46,811	34,438	79,390
9 mo.	503,781	330,351	.....
Oct.	65,921	42,414	75,706
Nov.	65,443	40,189	74,623
Dec.	58,583	36,562	75,293
Total	693,728	449,516	.....
1957			
Jan.	67,964	42,189	75,503
Feb.	59,793	36,580	74,739
Mar.	61,378	40,593	64,466
Apr.	54,982	34,801	59,534
May	53,565	35,676	66,712
June	49,356	33,206	64,137
July	48,379	29,418	64,043
Aug.	49,829	34,040	64,789
Sept.	47,736	33,838	68,122
9 mo.	492,982	320,341	.....

INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1956	1957
Jan.	195.6	117.9
Feb.	169.0	188.4
Mar.	152.7	127.0
Apr.	135.2	101.1
May	207.0	136.2
June	156.7	187.5
July	110.3	98.6
Aug.	188.3	231.3
Sept.	114.7	113.9
Oct.	122.2	....
Nov.	121.0	....
Dec.	115.6	....

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent monthly average. This is a new base period. Source: Foundry Equipment Manufacturers Association.

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	By Types of Furnace: Cupola Total	Air Total	Electric Total
1955	72,654,925	10,786,957	1,273,470	8,757,593
1956				
Aug.	5,453,927	803,123	92,200	807,131
8 mo.	46,185,250	6,643,212	768,978	6,358,802
Sept.	6,231,017	738,824	84,627	841,783
Oct.	6,722,320	890,389	101,773	935,008
Nov.	6,305,947	822,542	95,890	875,524
Dec.	6,264,955	722,320	82,160	851,770
Total	71,709,489	9,817,287	1,133,128	9,862,887
1957				
Jan.	6,630,804	874,764	102,782	927,499
Feb.	6,038,436	804,185	93,902	834,843
Mar.	6,294,038	814,372	92,534	903,149
Apr.	5,816,309	835,027	97,289	807,922
May	5,753,435	812,141	92,260	786,210
June	5,430,607	744,790	80,063	705,590
July	4,897,752	652,773	68,504	629,395
Aug.	5,299,543	765,877	81,941	759,517
8 mo.	46,180,924	6,303,929	709,275	6,354,125

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (Standard grades—net tons): Total	Foundry	Malleable & Silvery	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons): Total	Cupola	Air	Electric
1955	77,114,073	2,858,957	3,884,971	62,570,394	7,799,751	68,944,698	5,326,534	260,008	246,406
1956									
Oct.	7,246,650	245,762	321,188	6,001,279	678,421	6,053,147	366,848	19,642	18,239
10 mo.	61,041,605	2,112,839	3,056,032	50,019,290	5,903,444	47,883,208	3,581,574	198,039	154,161
Nov.	6,977,457	140,277	354,573	5,831,885	664,051	6,450,404	446,449	22,548	19,064
Dec.	7,268,743	149,745	322,631	6,099,101	697,266	6,237,538	391,632	21,557	17,161
Total	75,301,134	2,402,861	3,733,258	61,900,276	7,264,761	60,571,150	4,419,655	242,144	190,386
1957									
Jan.	7,209,547	135,608	344,073	6,081,137	648,699	6,482,472	423,660	22,989	20,431
Feb.	6,596,133	154,543	294,491	5,414,732	730,794	5,860,099	369,206	20,743	19,443
Mar.	7,179,100	168,650	347,451	6,008,135	654,864	6,155,334	370,915	20,241	23,259
Apr.	6,810,102	162,023	329,180	5,686,507	632,392	5,586,587	369,359	20,495	19,756
May	6,877,052	258,638	313,583	5,720,212	584,619	5,862,966	362,085	19,201	17,869
June	6,593,326	243,789	318,906	5,436,203	594,428	5,672,086	335,574	17,044	17,744
July	6,625,901	221,929	336,590	5,515,736	551,646	5,558,702	306,119	14,735	17,992
Aug.	6,719,763	228,378	298,269	5,451,691	741,425	5,769,995	349,988	17,540	25,948
Sept.	6,569,074	218,297	292,244	5,272,056	786,477	.....	.....	.....	.....
Oct.	6,454,450	164,944	303,104	5,390,851	595,551	.....	.....	.....	.....
10 mo.	67,632,845	1,956,799	3,177,891	55,977,260	6,520,895				

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For Sale only.

FOUNDREZ 7500 is a very finely powdered thermosetting phenolic resin. You will find that it blends easily, gives uniform shell mold structure and strength in economical sand-to-resin ratios.

When you produce shell molds with FOUNDREZ 7500, you reduce curing cycles. This remarkable RCI resin performs satisfactorily at extremely high oven temperatures, lets you turn out more molds per hour.

While FOUNDREZ 7500 works well in almost all applications, it is especially recommended for tough and intricate jobs where the patterns have a deep draw, and where the sand must flow, fill and bake extra well.

FOUNDREZ 7504 is very similar to FOUNDREZ 7500 but is faster setting and intended for use in high speed production. It generally gives a more rigid shell mold than FOUNDREZ 7500.

For large and small parts cast with any ferrous or non-ferrous material, shell molding with FOUNDREZ 7500 and 7504 is ideal... particularly for long production runs. For technical help or complete information, write to RCI Foundry Division in White Plains.

Creative Chemistry...
Your Partner in Progress

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REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Plasticizers
Phenol • Formaldehyde • Glycerine • Phthalic Anhydride • Maleic Anhydride
Sodium Sulfite • Pentaerythritol • Pentachlorophenol • Sulfuric Acid

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

Circle 668 on Page 51

American Laundry Machinery Company steam chests, cast with Hanna pig iron, need no plating. Instead, the casting is machined, ground and buffed to satin smoothness.

HANNA PIG IRON helps American Laundry Machinery Company iron flatwork fast and smooth

Laundrymen all over the country rely on equipment made by American Laundry Machinery Company for smooth, fast, large-volume ironing. They know that American Laundry Machinery Company's exacting quality standards assure good results with a minimum of wear.

Ever since the opening of their foundry in Rochester, New York, American Laundry Machinery Company's material specifications have called for Hanna pig irons. Since its development, the even higher strength HannaTite Pig Iron has been specified. This is a step taken to maintain the high quality required in such work as this flatwork ironer steam chest casting—a pressure vessel that must safely hold dry, saturated steam at 125 lbs. per square inch gage pressure. This application requires castings that upon machining are flawless and uniformly smooth—a specification met by the tight, fine-grained, pearlitic structure of HannaTite Pig Iron.

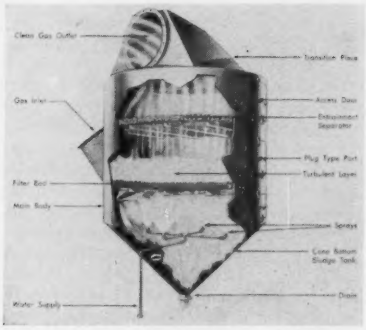
Hanna's high metallurgical qualities are synonymous with denser, stronger castings. Hanna makes all regular grades of pig iron, as well as HannaTite and Hanna Silvery. All grades are available in two sizes—the 38-pound pig and the smaller HannaTen ingot. Hanna representatives are always happy to be of service.

HANNA
THE BEST KNOWN NAME IN IRON

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

FOUNDRY EQUIPMENT AND SUPPLIES DIGEST

For More Details on These Items Use Reply Card —Page 192



DUST COLLECTOR

Type IC wet, scrubber type dust collector is designed for use where more than one collector will be used or wherever a common settling tank or sludge basin is employed. Claimed advantages are that common settling tank or basin can be used for several collectors; single sludge conveyor can serve several collectors; sludge collection operations can be centralized; fresh water consumption is reduced, and the filter can be elevated above floor level to release space for production. The collector operates under an air scrubbing principle and glass spheres are used in the separation action. No moving parts are within the collection area. Made by **National Dust Collector Corp.**, 700 Machinery Hall, Chicago 6, Ill.

For More Details Circle No. 401—Page 192

EPOXY RESIN CEMENT

Metalset A4 is an epoxy resin compounded to paste-like consistency with aluminum and other materials. It adheres strongly to steel, iron, aluminum, wood, and glass. When machined its color approaches that of cast aluminum. A4 can be used to smooth, fill or bond metal surfaces, or to fill cracks, seams, or holes in wood or metal. The material hardens chemically and can be applied to any thickness in one application. Newly developed measuring tubes permit the mixing of the correct amounts of resin and hardener to prepare the cement.—Made by **Smooth-On Mfg. Co.**, 572 Communipaw Ave., Jersey City 4, N. J.

For More Details Circle No. 402—Page 192

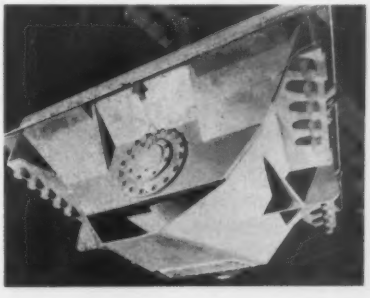
RADIATION DETECTION

Gardray Film Badge Service provides for personnel monitoring in x-ray laboratories, industrial plants, radioisotope laboratories, and other locations where exposure to radiation exists. Employees wear lightweight badges for a required period of time, then turn them in for processing and interpretation. Badges contain wearer's name, date, identification number, or other pertinent data. Reports on possible exposure are sent out promptly and are easy to read.—Service available from **Picker X-Ray Corp.**, 25 South Broadway, White Plains, N. Y.

For More Details Circle No. 403—Page 192

SHAKEOUT

Side discharge shakeout is engineered with a base-angled hopper arrangement which permits shakeout sand to be discharged to one side of the machine rather than straight down in the conventional manner. The unit is made for foundries faced with the problem of not being able to locate conveying equipment immediately below the shakeout. The shakeout is a new addition to the Allis-Chalmers shakeouts available in many sizes and capacities to meet required load, mold size, and available crane capacity. Made by **Allis-Chalmers Mfg. Co., Industrial Equipment Division**, Milwaukee 1, Wis.



For More Details Circle No. 404—Page 192

FRONT END LOADER

Model L-7 rubber-tired front end loader has a rated payload capacity of 19 cu ft and a struck capacity of 14 cu ft. Maximum lifting load is 3000 lb. The unit is the first, and smallest in capacity, of several models that will be built by Euclid for bulk material handling and other work suitable for front end loader equipment. Compact design permits operation in confined areas where power equipment cannot be used. Equipped with torque converter and power shaft transmission, speeds range up to 11 mph forward or reverse. Wheelbase is 48 in. Over-all length with bucket down is 10 ft 1½ in. Turning radius is 6 ft 2½ in. Ground clearance is 5 in. The rear-wheel steer, front-wheel drive loader is powered by a 49-hp gasoline engine. Made by **Euclid Division, General Motors Corp.**, Cleveland 17, Ohio.

For More Details Circle No. 405—Page 192

SELF-DUMPING HOPPER

Balanced self-dumping hopper of the forward roll type is designed for direct loading at point of generation. Its size permits it to be placed

by production machines or at points of waste accumulation in the plant. Hot or cold solids or liquids can be handled. The hopper can be moved by fork or platform truck or can be mounted on casters for in-plant handling. Capacities range from ½ to 3 cu yd. Made by **Ingersoll Kalamazoo Division, Borg Warner Corp.,** Kalamazoo, Mich.

For More Details Circle No. 406—Page 192

ENGINE STARTER

Model 300 engine starter mounts on either a 6 or 12-v service vehicle and carries an auxiliary battery of the same type used in the vehicle. The unit becomes an integral part of the vehicle's electrical system and is kept at full charge by the generator. The unit automatically starts any stalled engine when copper clamps are connected to the battery posts of the stalled engine and the remote control button is pushed.—Made by **Mondak Products Co.,** 5758 West Armitage, Chicago 39, Ill.

For More Details Circle No. 407—Page 192

LOW LIFT PALLET TRUCK

Rider type, low-lift pallet truck of 4000 lb capacity features redesigned reach rods beneath the elevating forks, specially tapered fork tip for easy pallet entry, and grease fittings for fast maintenance of all lever assemblies. Truck has three travel speeds in forward and reverse with a maximum of 4½ mph. Made by **Raymond Corp.,** 65-155 Madison Ave., Greene, N. Y.

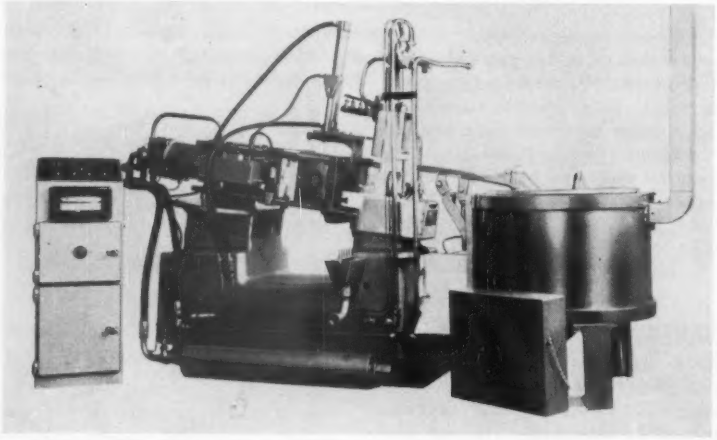
For More Details Circle No. 408—Page 192

INSPECTION EQUIPMENT

Magnesium and aluminum inspection equipment (angle plates, height blocks, tooling angles, straight edges, and parallel straight edges) offers weight-saving advantages to tool and patternmakers. The equipment weighs one-fourth to two-fifths of similar standard steel equipment. Hand scraped units accurate to within 0.0002 in. T.I.R. are available. Made by **Challenge Machinery Co.,** Grand Haven, Mich.

For More Details Circle No. 409—Page 192

Diecasting Machine Is Completely Automatic



FULLY AUTOMATIC diecasting machine requires no operator and can produce zinc alloy castings up to 1 lb at production of 1500 shots per hour. Automatic functions include machine cycling, die cleaning and lubricating, inspection for foreign material in the die, water control, replenishing molten metal supplied to the machine, and removal of castings from the die. The unit reportedly operates positively and automatically on every cycle.

Features of the Ram model that accomplish automatic operation are: 1. Fail-safe cycling to protect die mechanisms and personnel. 2. Die cleaning and lubricating mechanism operated from a separate control box on the die unit. 3. Electronic ladling device to keep metal at a predetermined level in the pot. 4. Thermostatic die temperature control of water valves to promote proper thermal balance in the die. 5. Separate electronic control unit for manual, single cycle automatic, or full automatic operation. 6. Flash sensing safety system to open die if foreign matter is present. 7. Removable die unit for instant die changeover. The machine is distributed through **DCMT Sales Corp.,** Dept. K-37, Port Washington, N. Y.

For More Details Circle No. 475—Page 192

LITERATURE

Aluminum Technology

"Alcoa and the Aviation Industry; Partners in Progress" depicts how progress in aluminum technology has paralleled advancement in aviation. Details are presented on new, high-strength casting alloys that maintain high strength at elevated temperatures, and a manufacturing technique that produces super-strength castings.—**Aluminum Co. of America,** 725 Alcoa Bldg., Pittsburgh 19, Pa.

For More Details Circle No. 410—Page 192

Electrode Guide

Electrode Pocket Guide, Form ADC 650G, contains information helpful to anyone concerned with buying or using electrodes. An electrode consumption calculator is one of the useful features of the booklet.—**Air Reduction Sales Co.,** a division of Air Reduction Co., 150 East 42nd St., New York 17, N. Y.

For More Details Circle No. 411—Page 192

Trolley Conveyor

October issue, "What's New with Mathews," presents engineering drawings and specifications plus illustrations and general information on No. 232 overhead trolley conveyor for light duty service up to 750 lb.—**Mathews Conveyor Co.,** Ellwood City, Pa.

For More Details Circle No. 412—Page 192

Portable Air Heaters

Folder illustrates and provides general information on portable air heaters with capacities from 75,000 to 450,000 Btu per hr.—**Herman Nelson Portable Products, American Air Filter Co.,** Moline, Ill.

For More Details Circle No. 413—Page 192

Steel Shot

Revised Catalog 89-C presents up-to-date information on all phases of manufacture, applications, and advantages of steel shot blast cleaning applications.—**Wheelabrator Corp.,** 1102 South Byrkit St., Mishawaka, Ind.

For More Details Circle No. 414—Page 192

Lift Truck Transmission

Bulletin 1399 describes the Duo-Torque transmission for lift trucks that combines features of both the torque converter and the fluid coupling with an added advantage of a power-shifted, two-speed

For Foundrymen

transmission.—**Baker-Raulang Co.**, a subsidiary of Otis Elevator Co., 1250 West 80th St., Cleveland 2, Ohio.

For More Details Circle No. 415—Page 192

Wet Blast Cleaning

Bulletin 1403 provides general information on the diversity provided by Pangborn Hydro-Finish—a wet blast cleaning cabinet in which compressed air forces a slurry of water and fine abrasive against the material to be cleaned.—**Pangborn Corp.**, 1400 Pangborn Blvd., Hagerstown, Md.

For More Details Circle No. 416—Page 192

Oxygen Analyzer

Data about prepackaged equipment for recording oxygen in the open hearth as a guide to improved combustion practice are found in Process Data Sheet 643 (5).—**Leeds & Northrup Co.**, 4934 Stenton Avenue, Philadelphia 44, Pa.

For More Details Circle No. 417—Page 192

Conveyor Pulleys

Design and construction features, load-rating data, and descriptive information on heavy-duty conveyor pulleys are offered in Catalog CP-57.—**American Pulley Co.**, 4200 Wissahickon Ave., Philadelphia 29, Pa.

For More Details Circle No. 418—Page 192

Welding Blowpipe

Welding blowpipe capable of welding any metal thickness from 28 gage sheet to 3-in. plate is described in Booklet 1107.—**Linde Co.**, division of Union Carbide Corp., 30 East 42nd St., New York 17, N. Y.

For More Details Circle No. 419—Page 192

Portable Gas Heaters

Form 259 illustrates and describes portable heating equipment—blower type and infrared heaters and salamanders for operation with LP gas.—**Insto-Gas Corp.**, 998 East Woodbridge Ave., Detroit 7, Mich.

For More Details Circle No. 420—Page 192

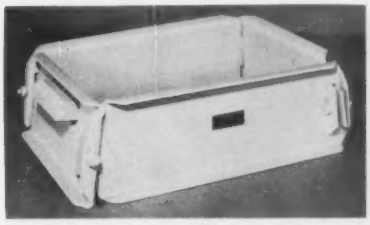
Induction Furnace

Brochure R58 describes characteristics and operation of a 60-cycle Ajax-Junker coreless induction melting furnace for ferrous and nonferrous metals.—**Ajax Engineering Corp.**, Trenton 7, N. J.

For More Details Circle No. 421—Page 192

FLEXIBLE MOLD JACKET

Flexible mold jackets can be made to any desired size and depth, with or without flanges. Ends and sides of the jackets are interchangeable so that the size of the jacket can be changed easily. If desired, larger sizes are supplied with a Transite lining. The jackets are engineered to



fit any tapered flask—vertical to 6 degrees taper. Construction material is 3/16-in. steel. Made by **Diamond Clamp & Flask Co.**, Richmond, Ind.

For More Details Circle No. 422—Page 192

BULK MATERIAL BLENDER

Blending unit is an aeration system that can be used in blending any dry materials which can be fluidized by compressed air. The system is capable of blending materials with different bulk densities and finenesses. It makes use of a round silo with a nearly flat bottom covered with aeration units closely placed to give uniform distribution of air. Compressed air is applied in pulsations to one quarter section at a time in volume sufficient to fluidize the material above that individual section. Material rises above the adjacent three quadrants. Aeration is periodically switched from quadrant to quadrant and as the material becomes aerated, expands, rises, and flows outward, it shortly becomes completely blended. —Made by **Fuller Co.**, Catasauqua, Pa.

For More Details Circle No. 423—Page 192

ELECTRIC VIBRATOR

Redesigned RC-50 electric vibrator has applications on bins, chutes, and hoppers for handling all types of dry and viscous bulk materials. The new unit develops a maximum vibrating impact of 2250 lb. It operates on the rotating eccentric weight principle and can be equipped with adjustable eccentrics permitting the vibration impact to be varied between 750 to 2250 lb. The vibrator contains no reciprocating parts. The only moving part is the rotor.—Made by **Cleveland Vibrator Co.**, 2828 Clinton Ave., Cleveland 13, Ohio.

For More Details Circle No. 424—Page 192

GRINDING WHEEL

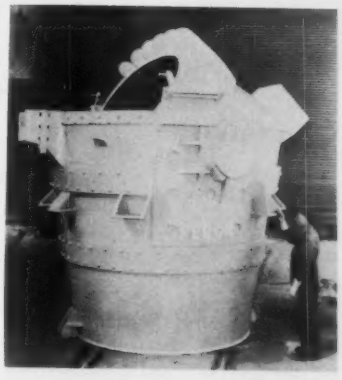
Newly developed porous grinding wheel uses balloon-like particles or brittle sponge-like rigid materials that break away to form air-conditioned voids in the cutting surface when the wheel is in use. The development is said to make possible better control of pore uniformity in denser, hot-pressed, resin-bonded

Mixing Ladle Features Unique Attachments

A HIGH-TEMPERATURE metallurgical mixing ladle includes a number of attachments not usually seen on a steel ladle. The 200 cu ft (inside refractory lining) capacity ladle handles material with a temperature range to 3200° F, and is designed for efficient operation and handling.

As shown in the illustration,, a slagging spout is on the left, and a square, boxed-in pouring spout on the right. The feet around the center sides and the heart-shaped block on the lifting trunnions provide locked, located support in the transfer and mixing equipment.

A removable section of hood (not shown) closes the top of the ladle completely while in transit to prevent loss of heat. The removable section has openings for burners if needed. Two tilting lugs on the bottom sides are used



to tip the ladle in either direction. The U-shaped swinging brackets at the top edge lock the ladle to the carrying hooks to prevent tipping. Made by **Pennsylvania Engineering Corp.**, New Castle, Pa.

For More Details Circle No. 476—Page 192

snagging wheels. It reportedly also makes possible the manufacture of more porous, cool-cutting wheels and segments.—Made by **Electro Refractories & Abrasives Corp.**, 344 Delaware Ave., Buffalo 2, N. Y.

For More Details Circle No. 425—Page 192

CONVEYOR LUBRICATOR

Single or double chains of slat type conveyors can be lubricated automatically by Model 114X conveyor lubricator. Air enters the lubricant reservoir through a regulator. Lubricant is carried through manifolds to outlet nozzles which direct a spray of fog to the wheel or chain link pins. A tripping mechanism is employed that is actuated by wheel or pins passing the lubricator. Valve opens by cam action, and oil fog is carried by suitable manifolds and nozzles to points of lubrication.—Made by **J. N. Fauver Co.**, 51 West Hancock, Detroit 1, Mich.

For More Details Circle No. 426—Page 192

WEAR RESISTANCE

Devcon WR is a wear-resistant, self-lubricating material that reportedly outwears steel 60 to 1 and can be cast without heat or pressure. It has been used, according to the manufacturer, for building up surfaces subject to severe wear, making duplicating masters and forming dies, tank linings, and repairing castings. Material is supplied in paste form, and upon addition of a hardening agent it becomes a syrupy liquid which can be cast or poured in a variety of shapes. In about two hours it becomes so tough and rigid that carbide or similar tools reportedly are required to machine it.—Made by **Devcon Corp.**, Danvers, Mass.

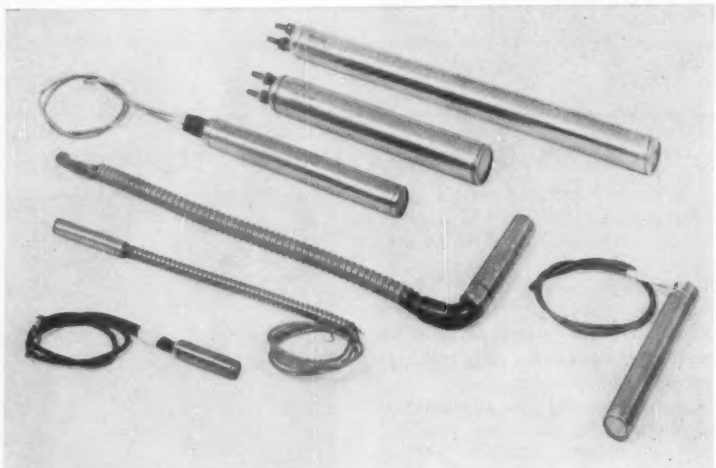
For More Details Circle No. 427—Page 192

IMPULSE MONITOR

Impulse monitor automatically provides for shutting down an electric salt bath heat treating furnace in the event of control instrument or relay failure. The monitor is set manually. Two ranges are offered —0 to 240 minutes or ½ to 30 hr. Should the monitor fail to shut off the power because of fused contact tips or similar trouble, it then signals an alarm over telephone lines, lights, bells, or other protective devices. Made by **Ajax Electric Co.**, Laurel & Delaware Aves., Philadelphia 23, Pa.

For More Details Circle No. 428—Page 192

Cartridge Units Provide Concentrated Heat



STAINLESS STEEL sheath cartridge heating units are designed for use in heating dies, platens, and molds where concentrated heat is desired and space is limited. The heating coil is supported by insulating material and enclosed in a stainless steel sheath with moisture-resistant, nickel-alloy, fiberglass-covered lead wires or screw type terminals.

The cartridges are available in all diameters and lengths. Units are sized to fit a drilled hole of the diameter ordered. Thermal expansion forces the cartridge surfaces into positive contact with all surrounding surfaces.

Voltages are 115 and 230 v, with special voltages and wattages available. Made by **C & S Products Co.**, 18656 Fitzpatrick Ave., Detroit 28, Mich.

For More Details Circle No. 477—Page 192

LITERATURE

Nonferrous Alloys

Catalog lists physical properties and conforming specifications for magnesium and aluminum alloys for sand and permanent mold castings. Rare-earth alloys also are included.—**Wellman Bronze & Aluminum Co.**, 12800 Shaker Blvd., Cleveland 20, Ohio.

For More Details Circle No. 429—Page 192

Open-Hearth Accessories

Water-cooled doors, frames, reversing valves, dampers, and other labor and material-saving devices for open-hearth furnace construction are detailed in Bulletin 2545-AJ57.—**Blaw-Knox Co.**, Steel Plant Equipment Dept., Box 1198, Pittsburgh 38, Pa.

For More Details Circle No. 430—Page 192

Load Cell Systems

Bulletin M-27 provides general information, photographs, and application data on load cell systems for accurately measuring compression and tension forces and for simplifying load weighing problems. — **Martin - Decker Corp.**, 3431 Cherry Ave., Long Beach 7, Calif.

For More Details Circle No. 431—Page 192

Welding Data Book

Welding Data Book TIS 2575A features simplified welding procedures for every base metal and is written to be a guide to improved torch and metallic arc welding, brazing, and soldering.—**Eutectic Welding Alloys Corp.**, Technical Information Service, Flushing 58, N. Y.

For More Details Circle No. 432—Page 192

Batch Ovens

Batch ovens for drying and baking applications in the laboratory, shop, or pilot plant are described and illustrated in Bulletin 5510-A. —**Soiltest Inc.**, 4711 West North Ave., Chicago 39, Ill.

For More Details Circle No. 433—Page 192

Heat Treating Units

Design and construction features of Model B heat treating units are highlighted in bulletin.—**Ipsen Industries Inc.**, 715 South Main St., Rockford, Ill.

For More Details Circle No. 434—Page 192

Rubber Compound

Catalog Sheet 5200 describes Armorite, a rubber compound said to provide exceptional resistance

For Foundrymen

to abrasion. It has applications in chutes, hoppers, and wearing surfaces handling sand or gravel, sandblast cabinets, and cyclone collectors and fan housings for abrasive dusts.—**B. F. Goodrich Industrial Products Co.**, Akron, Ohio.

For More Details Circle No. 435—Page 192

Silicones

Reference Guide 1-113 contains detailed charts, tables, graphs, and data on properties and performance of over 150 available silicone products, many of which have been introduced within the past year.—**Dow Corning Corp.**, Midland, Mich.

For More Details Circle No. 436—Page 192

Refractories

Bulletin 801 provides specifications, general information, and application data on Hifire, a high heat duty, dry press brick, for industrial heat treating furnaces and other thermal enclosures.—**Denver Fire Clay Co.**, 2301 Blake St., Denver 5, Colo.

For More Details Circle No. 437—Page 192

Flexible Couplings

Application and selection data for geared flexible couplings with maximum bores up to 7 in. and ratings from 2½ to 572 hp per 100 rpm are covered in Book 2775.—**Link-Belt Co.**, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 438—Page 192

Radiographic Materials

Kodak industrial radiographic materials are illustrated and described in pamphlet, "Materials and Accessories for Industrial Radiography."—**Eastman Kodak Co., X-Ray Sales Division**, Rochester 4, N. Y.

For More Details Circle No. 439—Page 192

Dust Collectors

Engineering drawings, dimensional tables, and design details of line of dust collectors are provided in Bulletin 150-A.—**Sprout, Waldron & Co.**, 130 Logan St., Muncy, Pa.

For More Details Circle No. 440—Page 192

Controlled Alloys

Folder highlights the guaranteed qualities of Rx Universal alloys for producing high-quality investment castings.—**WaiMet Alloys Co.**, 1999 Guoin St., Detroit 7, Mich.

For More Details Circle No. 441—Page 192

MATERIAL HANDLING BOX

Steel "hot" box is designed to withstand abuse of handling hot work in foundry, mill, and factory. Made of a low alloy high tensile steel, the unit is 53 in. long x 38 in. wide x 26 in. deep. Sides and bottom are corrugated and legs are squared on the bottom. Top of the box is

equipped with welded brackets into which the legs fit when one box is stacked upon another. A 16 in. clearance is provided for handling by fork lift trucks. Made by **Pressed Steel Division, Republic Steel Corp.**, 6100 Truscon Ave., Cleveland 27, Ohio.

For More Details Circle No. 442—Page 192

TRANSMISSION BELTING

Texalon stretch-free, all-synthetic belting for mechanical power transmission is made of woven nylon with a core of extruded nylon. Texalon can be made endless in a matter of minutes in the customer's plant or purchased to specifications. Nonfraying edges simplify cutting to any width. Ease of cementing allows use of short ends. Physical properties and characteristics vary with thickness of the belt.—Made by **J. E. Rhoads & Sons**, 2100 West Eleventh St., Wilmington 99, Del.

For More Details Circle No. 443—Page 192

TEMPERATURE CONTROL

Type F-7 remote bulb temperature control has wide range of applications, including use in core or mold ovens. It has two integral assemblies—the remote bulb thermal device and the control head with connecting capillary tube of varying lengths. Models have adjustable ranges between minus 150° to 650° F and on-off differentials of approximately 1.0° to 2.0° F.—Made by **United Electric Controls Co.**, 79 School St., Watertown, Mass.

For More Details Circle No. 444—Page 192

AIR-HYDRAULIC CYLINDER

Air and hydraulic cylinder designed for extra strength plus resistance to outside damage features external threads on the cylinder barrel with internal threads on the heads to prevent "breathing" under high pressures. Heads are made of cast steel and are O-ring sealed. Cylinder is available as standard or custom made items. Made by **Remco Mfg. Co.**, Petaluma, Calif.

For More Details Circle No. 445—Page 192

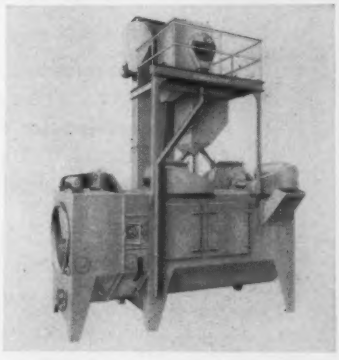
FORCED DRAFT BLOWER

Airfoil mechanical draft fan for central power stations and heavy industrial service furnishes static pres-

Blast Cleaning Unit Features End Discharge

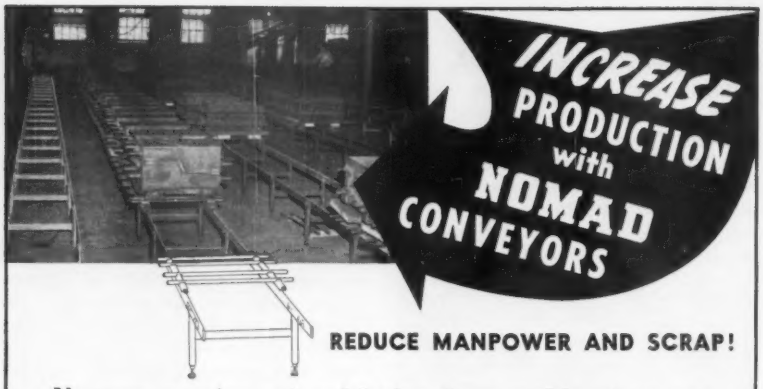
A 26-IN. CONTINUOUS Tumblast with end discharge is newest addition to company's tumbling-type blast cleaning machines. The unit is designed to handle a continuous flow of miscellaneous work at high production rates. Cleaning is completely automatic. Work enters machine from one end into the cleaning chamber, passes down an inclined chute into a discharge drum, and is dropped into a tote box or conveyor.

Blast chamber is a full-length, full-diameter, endless apron conveyor. As the blast unit is located above the full diameter of the tumbling mill, the chamber is clear and unobstructed. The combination of tumbling and longitudinal travel exposes all surfaces of every part uniformly to the abrasive blast of the overhead



Wheelabrator unit or units. Production can be geared to most any need. Other sizes in this line are 15, 36, 48, and 60 in. Made by **Wheelabrator Corp.**, 1102 South Byrkit St., Mishawaka, Ind.

For More Details Circle No. 478—Page 192



INCREASE PRODUCTION with NOMAD CONVEYORS

REDUCE MANPOWER AND SCRAP!

No more running out and laying down molds when you use Nomad's Track Conveyor! Molds "roll away" on roller-equipped pallets, as shown, or on roller-equipped bottom boards. Time saved by eliminating running out of molds increases production. Molds move without vibration . . . shifted molds are reduced—resulting in less scrap. Switches, transfer cars and turntables can add even more to the flexibility of your foundry output.

Write for information.

WESTOVER CORPORATION
NOMAD EQUIPMENT DIVISION
3110 W. FOND DU LAC AVE. • MILWAUKEE 10, WIS.

NOMAD FOUNDRY EQUIPMENT

Circle 670 on Page 51

COKE WHEN YOU WANT IT

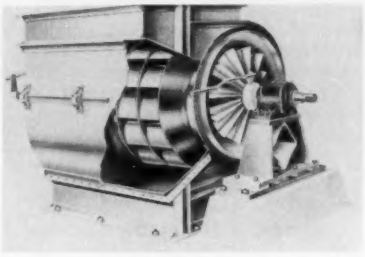
Only Semet-Solvay has 4 coke plants to serve you. There's one in your vicinity. For fast service, for dependable, uniform coke that means "Better Melting" specify Semet-Solvay Foundry Coke.

SEMET-SOLVAY DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street — *New York 6, N. Y.*
Buffalo • Cincinnati — Cleveland • Detroit
In Canada: SEMET-SOLVAY COMPANY, LTD., Toronto
Western Distributor: WILSON & GEO. MEYER & CO., San Francisco

For Better Melting

Circle 671 on Page 51

sure from ¼ to 32 in. in volumes ranging up to 1,097,940 cfm and temperatures up to 900° F. Inlet vane controls provide manual or automatic regulation of fan output. Hollow section airfoil blades eliminate eddy



currents and provide smooth air passage over the blade surface. Housings are made of heavy steel plate. Flanged inlets and outlets and quick-clamp access doors are supplied on all housings. Made by **Chicago Blower Corp.**, 9863 Pacific Ave., Franklin Park, Ill.

For More Details Circle No. 446—Page 192

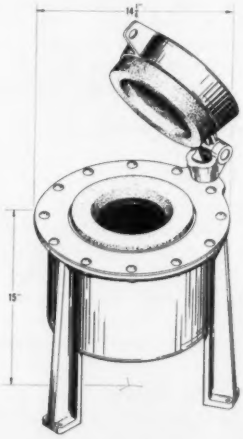
RUST PREVENTIVE

No. 71 rust preventive can be applied by spraying, brushing, or dipping and reportedly protects all surfaces against general rusting and oxidation. Paint can be sprayed over the material, which can be applied to outside equipment as well as to fine precision instruments. Made by **Bel-Ray Co.**, Dept. 104, Green Village Rd., Madison, N. J.

For More Details Circle No. 447—Page 192

LABORATORY FURNACE

Laboratory furnace operates on any available fuel gas—natural, manufactured, mixed, or liquefied pe-



troleum—and air. It reaches 3200° F (1760° C) from room temperature in one hour and reportedly holds that temperature with fuel consumption

of 160,000 Btu per hr (153 cfh natural gas). Charge space is 4½ in. diam (max) x 2¾ in. (max). A floor-mounted model as well as a bench model is available. Made by **Selas Corp. of America,** Dresher, Pa.

For More Details Circle No. 448—Page 192

VISITOR'S SPECTACLES

Safety spectacles designed for plant visitors are molded of cellulose acetate and are packaged in a sealed cellophane envelope. Spectacles are intended to be a give-away item to eliminate the cleaning, sanitizing, and repackaging generally required of standard safety spectacles. Made by **Industrial Products Co.,** 2827 North Fourth St., Philadelphia 33, Pa.

For More Details Circle No. 449—Page 192

FLOOR SWEEPER

A 32-in., walk-behind floor sweeper is designed for sweeping congested corerooms, foundry areas, narrow aisles, and around ovens and furnaces where mechanized sweeping has been impractical previously. A high-powered vacuum system sucks dirt and dust into a 1900-sq-in. fabric bag; heavy litter, picked up by the main brush, is thrown into a removable hopper. Machine weighs 275 lb and is 33 in. wide. All controls are within easy reach of the operator. Made by **G. H. Tennant Co.,** 721 North Lilac Dr., Minneapolis 22, Minn.

For More Details Circle No. 450—Page 192

STRIP-CHART RECORDER

Electronic Dynamaster X-Y Recorder plots a continuous curve showing the relationship of one measured variable to another. The unit records on a 12-in. strip chart and is available in pen speeds of up to 0.4 seconds for full-scale traverse to follow the most rapidly changing variables. Standard accuracy is 0.25 per cent.—Made by **Bristol Co.,** Waterbury 20, Conn.

For More Details Circle No. 451—Page 192

PALLET TRUCK

Pallet truck uses LPG fuel coupled with a Ready Power Co. W-12 unit to provide continuous operation without need for recharging. Unit has a self-starter and the LPG unit automatically adjusts itself to the load. Two speeds forward and reverse of about 3½ mph empty and 2½ mph loaded are attainable. A dynamic brake is operated from the control handle and a mechanical brake is applied automatically when the steering handle is released. Capacity is 4000 lb. Made by **Lift Trucks Inc.,** 2425 Spring Grove, Cincinnati 14, Ohio.

For More Details Circle No. 452—Page 192

GAGE BLOCK MAINTENANCE

Necessary tools for gage block maintenance are supplied with each gage block of 38 pieces or larger. The kit includes a black granite-Diorite deburring stone, camel's-hair brush, insulated forceps, box of lint-free wiping paper, two booklets, and two Aerosol type containers of liquids for gage block care. Booklets are "The Facts of Gage Block Life" and "How to Be Your Own Bureau of Standards."—Made by **DoAll Co.,** 254 North Laurel Ave., Des Plaines, Ill.

For More Details Circle No. 453—Page 192

PNEUMATIC OILER

Inject-O-Mist pneumatic oiler for portable tools which operate on intermittent principle is made of ⅛-in. wall aluminum end bells and air passage tube with a visual plastic oil gage centrally located. Exterior aluminum parts are anodized. The oiler attaches directly onto the air

Simplify
foundry use
of refractories
and SAVE
with multi-purpose
IRONTON
BERLITE

ONE REFRACTORY does 7 jobs to SIMPLIFY your foundry routine. Add the necessary water to **Ironton BERLITE** and put it to work 7 ways:

RAMMED LINING for bull, mixing ladles.
MUD LINING for hand and bull ladles.
RAMMING MIX for tap & slag holes, spouts.
MORTAR for brick-lined ladles.
MORTAR for cupola block.
PATCHING MATERIAL for all ladles.
WASH COATING for ladles & cupola spouts.

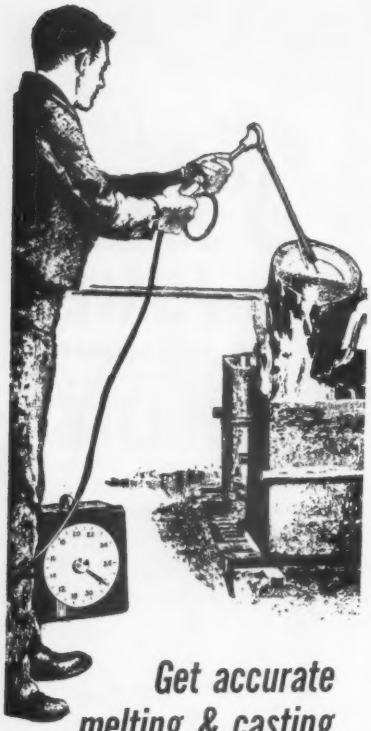
SAVE ON LONGER SERVICE

Slag and metal do not stick to **Ironton BERLITE** . . . so linings are not destroyed in cleaning ladles. **MORE REFRACTORY** than any fire clay brick, **Ironton BERLITE** does not melt or slag out. Since **BERLITE** meets every refractory need, your inventory and delivery worries are over. You'll eliminate refractory repairs, too. **BERLITE** is stored dry; you should never have any waste. Day-to-day service tests prove these facts.

We will send you enough **Ironton BERLITE** to test in your shop under your conditions. We ask only that you pay the freight. If you need help, Ironton engineers are always available to work with your men and show them exactly how to use **BERLITE.** Write or phone us **today.**

THE IRONTON FIRE BRICK COMPANY
SINCE 1917
IRONTON, OHIO
1379 Ashtabula Street
Reliable Refractories

Write for name of nearest representative, or telephone Ironton 109



Get accurate melting & casting temperatures . . . IN SECONDS!

Now, in 10 seconds or less, you can get precise molten metal temperature measurements in induction furnaces, pot furnaces, ladles, risers, test spoons, runner boxes, troughs, lab furnaces . . . anywhere in the shop.

The operator simply dips the platinum tip of the L&N Portable Thermocouple—protected by its expendable, low-cost quartz sheath — into the molten metal. In seconds, he sees true temperature boldly indicated on the 23-inch circular scale of the portable, a-c operated Speedomax H potentiometer indicator.

Simple to use, economical to maintain, this equipment has been enthusiastically received in hundreds of foundries and melt shops. It's available as a complete "package"—with an indicator range of 1000 to 3000 F, or 2000 to 3200 F, as specified—ready for immediate use.

A call to your nearby L&N Field Office will bring full information . . . or write for Data Sheet N-33A-681(3) to Leeds & Northrup Company, 4917 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP
Instruments Automatic Controls • Furnaces

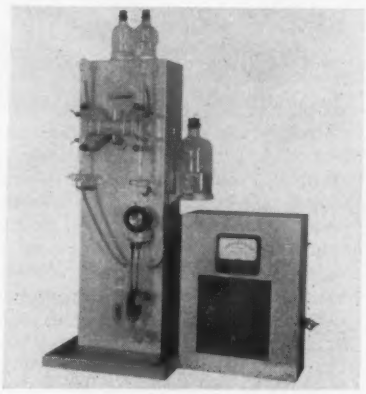
Circle 673 on Page 51

tool and assures automatic airborne oiling to all parts of the tool. Weight of the unit is 5½ oz. Made by **Carlson Products Inc.**, 5309 North 24th St., Omaha 10, Nebr.

For More Details Circle No. 454—Page 192

SULFUR DETERMINATOR

Automatic sulfur determinator accomplishes titration by the addition of the proper titrant to the test so-

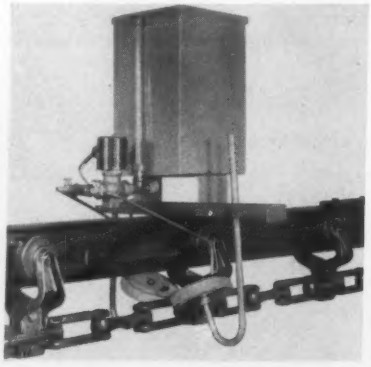


lution until there occurs a condition called the "end point." The end point is determined photoelectrically by automatic addition of the titrant until the initial color intensity of the test solution is attained, at which point the flow of titrant is shut off and a signal light indicates the end of titration. Over or under titration is eliminated and an operator need not be present during the combustion period. Made by **Lindberg Engineering Co.**, Laboratory Equipment Division, 2450 West Hubbard St., Chicago 12, Ill.

For More Details Circle No. 455—Page 192

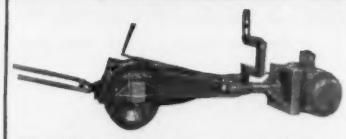
CONVEYOR OILER

Automatic oiler for conveyor chain links and pins applies an even film of oil by direct contact of oil-carry-



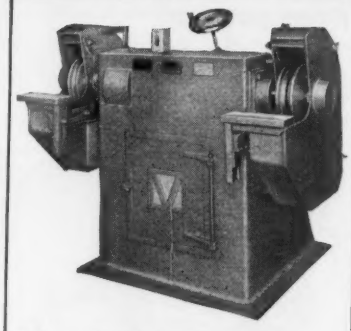
ing felt rollers. There is no mist, spray, or dip. The new type oiler can be used with all chain type conveyors. A solenoid valve starts and stops

MARSCHKE



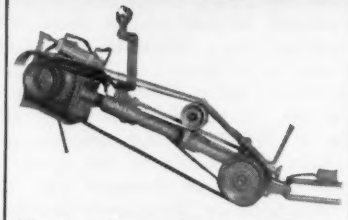
The finest heavy duty swingframe grinder on the market today. Built to withstand plenty of abuse, affords extreme maneuverability, dependable as the Rock of Gibraltar. Write for Bulletin No. 112.

MARSCHKE



The undisputed champion in any grinder division. Precision built to provide maximum wheel life and metal removal. A maintenance man's favorite for long, trouble-free service. Write for Bulletin No. 108.

G and P "HD"



Here's a heavy duty swingframe BELT grinder to do those tough, difficult jobs quickly and easily. Wide choice of horse power, belt dimensions and SFPM. Adaptable to special applications combined with other machines. Write for interesting Bulletin No. 110.

Grinding and Polishing Machinery Corp.
SUCCESSORS TO VONNEGUT MOULDER CORPORATION
2530-A WINTHROP, INDIANAPOLIS 5, IND.

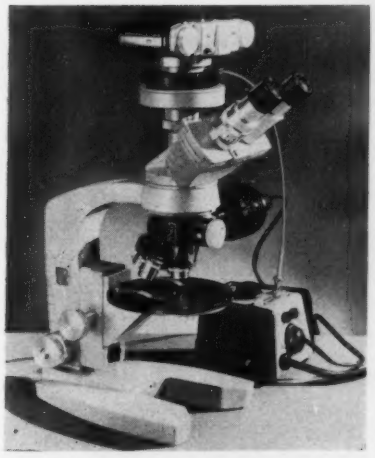
Circle 674 on Page 51

oil flow as the conveyor starts and stops. Two needle valves control oil flow to each side of chain after solenoid valve is opened. Made by **Olsen Mfg. Co.**, 638 South Rochester Rd., Clawson, Mich.

For More Details Circle No. 456—Page 192

MICROSCOPES

Metallurgical microscopes feature a circular stage that permits rapid, precise specimen positioning under the objective in any horizontal direction. Stage is focusable to the objective by both coarse and fine adjustment knobs. Four interchangeable, rotatable inclined bodies are available—monocular, binocular, trinocular, and special monocular body. A double, triple, or quadruple revolving nosepiece, or a single nosepiece with a quick change adapter can be supplied. A variety of models is available. Made by **American Optical Co.**, Instrument Division, Eggert & Sugar Rds., Buffalo 15, N. Y.



For More Details Circle No. 457—Page 192

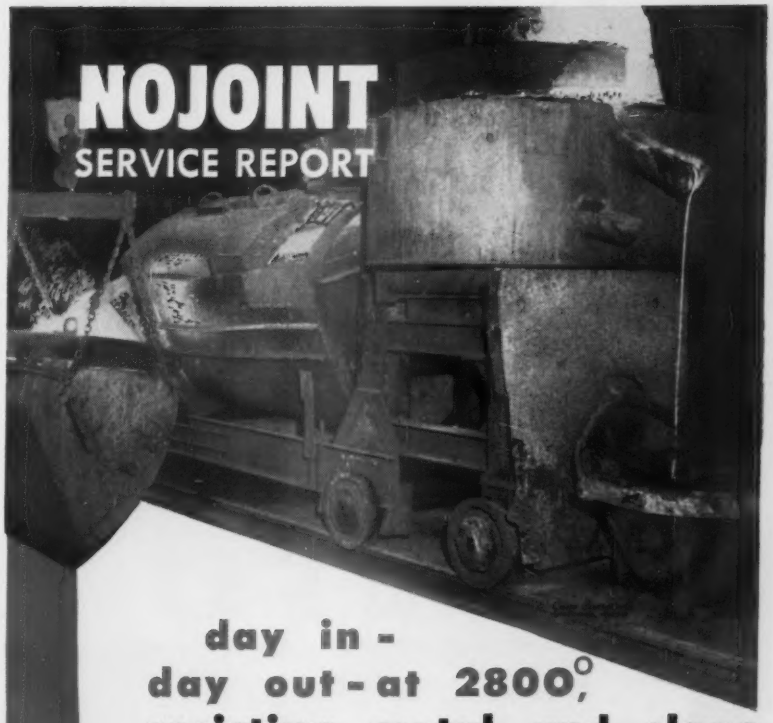
ZIRCONIUM SPONGE

Commercial-grade zirconium sponge is available in tonnage quantities. The zirconium, which contains about 2 per cent hafnium, reportedly has outstanding resistance to strong, hot mineral acids and to strong alkalies. It is being used in developing melting techniques for reactor-grade zirconium sponge and for experimental and prototype work in the nuclear energy field. Made by **Columbia-National Corp.**, 70 Memorial Dr., Cambridge 42, Mass.

For More Details Circle No. 458—Page 192

DUST COLLECTOR

Roll-away dust collector is suited for operations where dust volume is large, the need for air volume is comparatively low, and floor space is at a premium. The dust bin has a 9-cu-



day in -
day out - at 2800°,
resisting metal and slags

IN A HOLDING LADLE of 12,000 lbs. capacity, operating continuously at Glamorgan Pipe and Foundry Co. in Lynchburg, Virginia, the lining is *Ironton* NOJOINT. An average of 230 tons of metal at 2600°-2800° goes through the U-shaped ladle daily. At that heat, and on that schedule, a refractory really gets a chance to prove its dependability.

J. H. Sale, Chief Metallurgist, says *Ironton* NOJOINT is the best refractory for the purpose when all factors are considered. The NOJOINT lining stands up against metal and slags for 10 weeks. Maintenance costs are low, too (the lining was spot-patched only once in 50 working days). Installation is easy, goes fast with an air rammer because NOJOINT is shipped with carefully controlled moisture content.

A fully detailed report on *Ironton* NOJOINT performance at Glamorgan Pipe and Foundry Co. is available. Write today for your copy.

NOJOINT STORED TWO YEARS
STAYS MOIST, READY TO USE

NOJOINT is available dry in bags, and moist in cartons or drums. The 550 lb drum is a true economy under today's conditions. NOJOINT will keep as long as two years in the drum with lug-closing lid. We tell you how to get it out quickly, easily. Order a 550 today and save money on the quantity, save freight costs on repeated small shipments.

Since 1917
RELIABLE REFRACTORIES
THE IRONTON FIRE BRICK COMPANY
IRONTON, OHIO
1377 Ashtabula Street

Write for name of nearest Ironton representative, or Telephone Ironton 109

ft capacity and the unit is powered with a ⅓-hp motor. A cast aluminum fan can handle sizable metal fragments and wood chips without plugging. The collector also is available as a recirculating unit using a cloth filter bag or a conventional Fiberglas filter. Made by **Aget Mfg. Co.**, Adrian, Mich.

For More Details Circle No. 459—Page 192

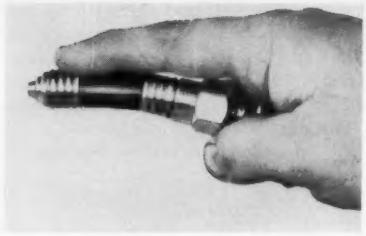
V-BELT FASTENERS

Alligator aluminum end plate fasteners are available for high-speed drives. The fasteners are claimed to reduce belt whip in the higher speed ranges and prolong internal working parts. Permanently assembled fasteners also have been developed for use where a separable joint is not required.—Made by **Flexible Steel Lacing Co.**, 4607 Lexington St., Chicago 44, Ill.

For More Details Circle No. 460—Page 192

AIR BLOW GUN

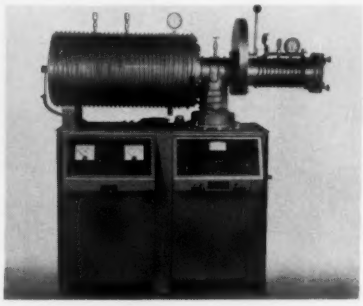
Flexible tip air blow gun has a nonremovable tip with a standard orifice, a flexible neoprene body for easy flexing, ¼ or ½-in. IPT fittings, and an internal shut-off valve fully operable with 20 psi line pressure. The Air-Lok gun operates without buttons, handles, or levers but uses finger pressure to control air volume. Made by **Toolcraft Products Co.**, Box 92, South Pasadena, Calif.



For More Details Circle No. 461—Page 192

ANNEALING FURNACE

Vacuum annealing furnace for laboratory or light production requirements converts to a melting furnace so that one basic unit makes a complete installation for vacuum processing. The double pumped muffle type furnace with a hot zone of 6 in. ID by 12 in. long can operate continuously at 2150° F or intermittently at 2200° F at a pressure of 1 x 10^{-4} mm Hg, or less. Vacuum retort and cooling chamber are insulated completely and water cooled. Indicating instruments provide a check on the operation and a variety of optional recording instruments is available. Made by **High Vacuum Equipment Corp.**, 2 Churchill Rd., Hingham, Mass.



For More Details Circle No. 462—Page 192

DUST COLLECTORS

"Grind-Air-rester" conversion units convert existing grinders into a combination arrangement and take but a few additional inches beyond the depth of an existing pedestal grinder. The illustration at left identifies a combination pedestal cabinet to serve 7, 8, or 10-in. grinders. Dimensions are: A—8¾ in.; B—11⅜ in.; C—26⅜ in. Illustration at right has capacity for two 12-in. or two 14-in. wheels. The A of 16 in., and B of 12 in., is adequate to serve the average base

In the Final Analysis..

BAIRD-ATOMIC HAS LED THE FIELD IN INDUSTRIAL EMISSION SPECTROSCOPY

for more than 20 years

12 of 15 largest steel producers

6 of 8 leading aircraft manufacturers

3 of 4 major automobile producers

21 of 27 largest petro-chemical companies

10 of 14 largest non-ferrous metals producers

18 of the 25 largest industrial corporations

USE **Baird-Atomic** SPECTROCHEMICAL EQUIPMENT

The nation's leading industrial plants use Baird-Atomic analytical instruments in production, quality control, and research for these reasons . . . .

FIELD LEADERSHIP — first in the development of the Direct Reading Spectrometer with Automatic Servo Monitor*, the complete spectrographic laboratory — the high-resolution, single optical surface, 3-Meter Grating Spectrograph — the versatile "foundry floor" Spectromet®.

EQUIPMENT RELIABILITY — now, as well as during the past 20 years, all B-A equipment is engineered, manufactured and serviced by Baird-Atomic.

ENGINEERING KNOW-HOW — the largest engineering staff devoted exclusively to designing, developing and servicing spectrographic instrumentation for better analysis.

CONFIDENCE — the largest number of repeat orders, proof of customer satisfaction.

✓ Based on FORTUNE MAGAZINE'S 1957 Directory of the 500 largest Industrial Corporations

*Patent applied for

For further information on B-A analytical equipment write to:

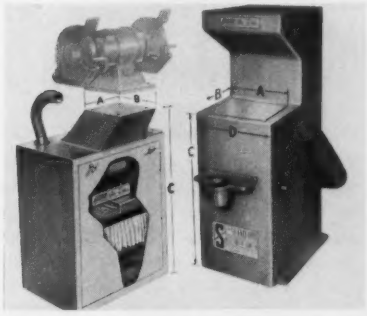
Baird-Atomic, Inc.

33 UNIVERSITY RD., CAMBRIDGE 38, MASS.

Baird Atomic

Instrumentation for Better Analysis

mounting on a 2 or 3-hp grinder. The D width of 17½ in. is the required clearance between exhaust guards. C

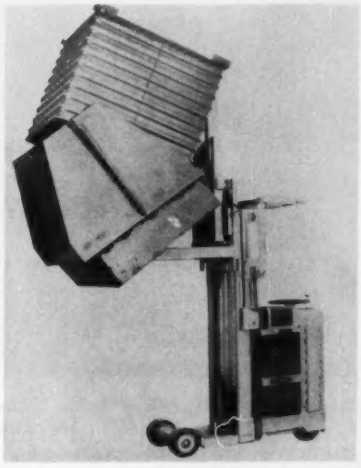


is 32½ in. Made by **Standard Electrical Tool Co.**, 2507 River Rd., Cincinnati 4, Ohio.

For More Details Circle No. 463—Page 192

HANDLING ATTACHMENT

Special attachment for handling drop bottom boxes is for use on company's narrow aisle platform or straddle trucks. Attachment consists of a hydraulic cylinder mounted at the rear of the platform or forks which elevates a broad hook interlocking with a mating hook on the box. As the rear of the box raises,



the swivel bottom swings down allowing the contents of the box to flow out. Dumping may be done at any point in the truck's range of elevation. Made by **Raymond Corp.**, 65-157 Madison Ave., Greene, N. Y.

For More Details Circle No. 464—Page 192

FLANGED TRACK WHEELS

Single and double flanged wheels designed for track car use in plants, mines, and quarries are available in semisteel or annealed ductile cast iron in sizes ranging from 5 to 15 in. in diam. They can be supplied with plain bearings or equipped with

tapered bearings and pressure lubrication fittings. Load capacities range from 500 to 6000 lb. Made by **Hamilton Caster & Mfg. Co.**, 1700 Dixie Highway, Hamilton, Ohio.

For More Details Circle No. 465—Page 192

GERMICIDAL DETERGENT

Germicidal detergent for cleaning and sterilizing personal equipment as goggles, respirators, face shields, and helmets is available in cartons of 25 one-ounce packages. Each package dilutes with one gallon of water. A wall bracket dispenser keeps the detergent dry and dispenses a single package at a time. Made by **American Optical Co., Safety Products Division**, Southbridge, Mass.

For More Details Circle No. 466—Page 192

SAFETY GLASSES

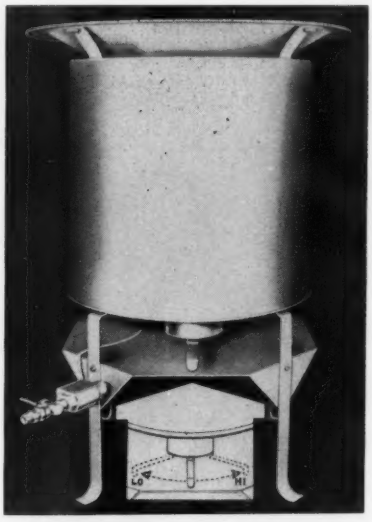
Safety glasses incorporate plastic frames to provide a durable, long-wearing frame in which lenses can be replaced easily. Lenses are offered in clear Super-Safety No. 1, antiglare

Super-Safety No. 2, or clear Cescolite plastic. Glasses are supplied in 46 x 39 mm and 48 x 41 mm eye sizes. Bridge sizes are 20, 22, 24, and 26 mm sizes. Lenses are in 6.00 curve only. Made by **Chicago Eye Shield Co.**, 2721 Roscoe St., Chicago 18, Ill.

For More Details Circle No. 467—Page 192

SALAMANDER

Variable input salamander uses constant pressure, is equipped with an automatic safety shut-off, and features a lever control which adjusts from minimum to maximum Btu output at a flick of the finger



to assure positive heat control. The Model 1900 unit is said to be clean burning, producing no smoke or soot at any setting. A single burner is used. Made by **Weldit Inc.**, 990 Oakman Blvd., Detroit 38, Mich.

For More Details Circle No. 468—Page 192

ELECTRIC FORK TRUCK

Redesigned 2000-lb capacity, electric-powered fork lift truck has a lift speed of 72 fpm for rapid stacking, top travel speed of 6½ mph, short turning radius, and 36 degree steering. Stand-up end controls permit unobstructed operator visibility. Dead man controls and overload valves protect operator and load. All speeds are controlled by foot, leaving the operator's right hand free to

SPENCER VACUUM SYSTEM

handles both CONVEYING and CLEANING ... at this Metals Plant

Pneumatic Conveying of lead, zinc and copper dust here is quick, dust-free and economical. Heavy material which settles out in breeching connecting the smelter to the Cottrell drops into hoppers. Once a day these hoppers are emptied by opening a slide gate valve. The accumulated heavy dust drops into a 6" Spencer vacuum line and is whisked back to the smelter.

General Plant Cleaning, carried on whenever system is not being used for conveying, is done with standard 1¾" and 2" Spencer hose and tool equipment. This bonus use of vacuum assures positive, dust-free sanitation.

Whatever **your** need in vacuum systems . . . for pneumatic conveying, cleaning, or **both** . . . it will pay to check with SPENCER —leader in developing systems to meet **individual** needs.

INSTALLATION DATA

Vacuum Producer: 60 H.P. Spencer.
Conveying Capacity: 7½ Tons per hour.
Primary Separator (1): 42" with 8" motor-driven rotary discharge valve.
Secondary Separators (2): 50" bag type with motor-driven bag shakers, automatic sequence timers and solenoid-operated valves.

Request these informative Bulletins:
No. 143-B Spencer Pneumatic Conveying
No. 155-B Spencer Vacuum

PORTABLE VACUUM CLEANERS
BLOWERS
SPENCER

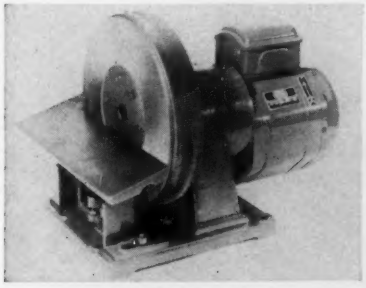
The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

hoist and tilt.—Made by **Elwell-Parker Electric Co.**, 4205 St. Clair Ave., Cleveland 3, Ohio.

For More Details Circle No. 469—Page 192

ROTARY POWER TOOL

The R-Filemaster multipurpose rotary power tool features curved teeth of hardened tool steel that are designed to form a rolling chip which is eliminated radially. The tool is designed for filing, shaping, and milling of any material that can be worked with a file. The filing tools are motor driven through a spur gear reduction unit. Rings are available in fine, medium, or coarse cut. Overall dimensions of the R-Filemaster are 12¼-in. width, 17-in. depth, 12½-in. height. Distributed by **Hudson Automatic Machine & Tool Co.**, 137-38th St., Union City, N. J.



For More Details Circle No. 470—Page 192

PYROMETER

High-temperature pyrometer measures temperature of hot objects without touching them by measuring the radiant energy given off by the objects. The instrument is useful in measuring temperature of objects beyond the normal range of thermocouples, moving objects, or where corrosion or other conditions eliminate the use of conventional resistance detectors.—Made by **Robertshaw-Fulton Controls Co., Instrument Division**, 2920 North Fourth St., Philadelphia 33, Pa.

For More Details Circle No. 471—Page 192

EYESHIELD

All-plastic eyeshield is available in two sizes—large, for men, and small, for women. One-piece optical lens can be removed and replaced without tools. Eyeshield is recommended by manufacturer for plant visitors, supervisors, machine operators, or on any job requiring lightweight, comfortable, nonflammable, and nonsparking eye protection. Made by **United States Safety Service Co.**, 1535 Walnut St., Kansas City 8, Mo.

For More Details Circle No. 472—Page 192

DUST COLLECTOR

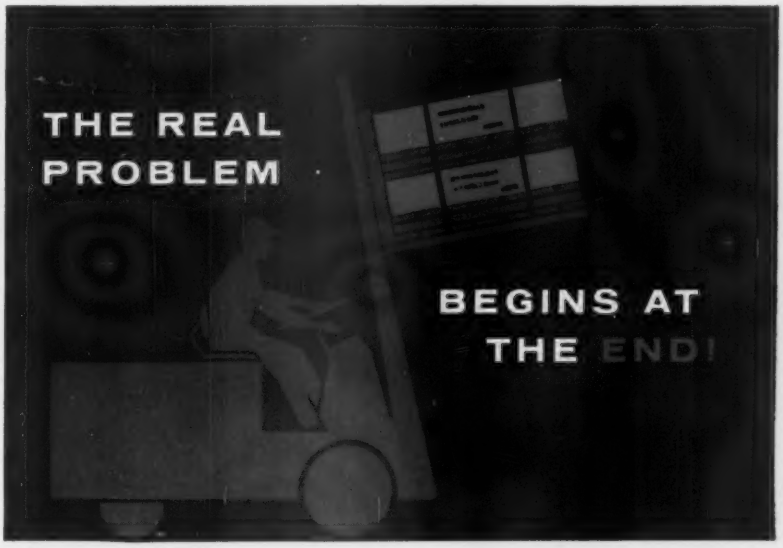
Model WWB5 Dustender portable dust collector especially adaptable to woodworking shops is designed to handle large bulking dusts which are accompanied by a large percentage of fines. Dust storage compartment has a 3½-bu capacity and is made of a tearproof, ripproof fabric. Unit is caster mounted for movement from one machine to another or for general shop cleaning with a flexible hose.—Made by **Dustender Co.**, 3539 Pontiac Rd., Ann Arbor, Mich.

For More Details Circle No. 473—Page 192

HEAT-RESISTANT COATING

Endura-temp paint for iron and steel and their alloys reportedly withstands heat to 1500° F. The material can be sprayed, brushed, or dipped on clean metal surfaces. It dries at room temperature to form an immediate weather and corrosion-resistant coating. After drying, the coating adjusts to high temperatures while in progressively hot usage. One gallon protects 600 sq ft.—Made by **Products Development Corp.**, 824 Connecticut Ave. N.W., Washington 6, D. C.

For More Details Circle No. 474—Page 192



The problem starts with a blastcleaning operation. It is partially solved when you *buy* a quality shot or grit. The handling of hundreds of pounds of shot and grit can be a costly and bothersome task.

The best way to solve the real problem . . . the whole problem . . . is with Cleveland Metal Abrasive. Through years of service, Cleveland Metal Abrasive Company has gained a reputation for consistently high quality and uniformity. And Cleveland Metal Abrasives are custom-packaged to suit your needs. All shipments of Cleveland Metal Abrasives can be palletized, covered and/or banded.

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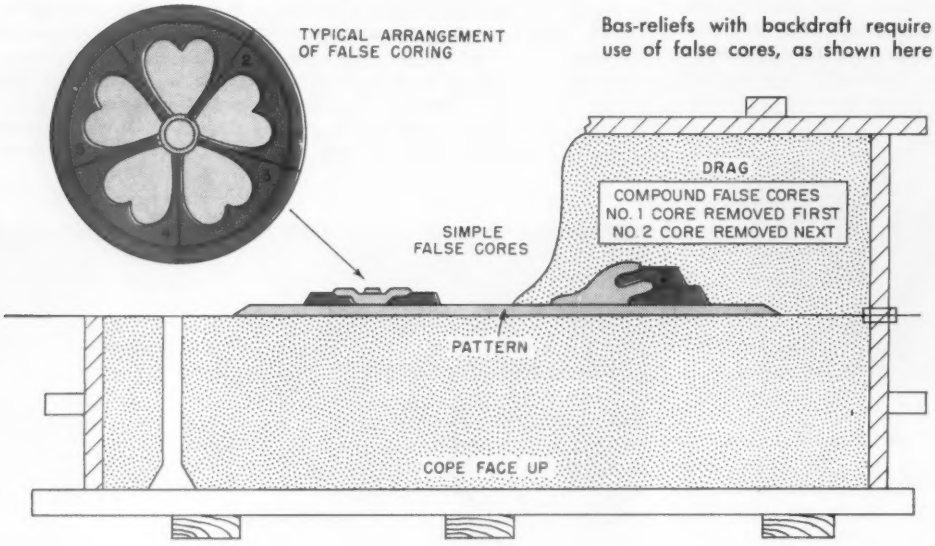
One of the world's largest producers of quality shot and grit—Hard Iron—Malleable (Normalized*)—Cast Steel (Realsteel*)
*Copyrighted trade name

Trouble Shooting

By C. W. AMMEN


TYPICAL ARRANGEMENT OF FALSE CORING
Bas-reliefs with backdraft require use of false cores, as shown here
DRAG
COMPOUND FALSE CORES
NO. 1 CORE REMOVED FIRST
NO. 2 CORE REMOVED NEXT
SIMPLE FALSE CORES
PATTERN
COPE FACE UP

False Coring Bas-Reliefs

Dear Charlie:

Man, you know I get into some hot ones. Remember Mrs. G.? Over the years, I have made a number of plaques and bas-reliefs for her and have done fairly well. I just used a good, fine, naturally bonded sand and skin drying. Until a few days ago, I was under the impression that a bas-relief was without backdrafts and projected only slightly from the face. But Mrs. G. is getting pretty fancy. She left a plaster of a bas-relief and took off like a tattooed goat.

Well, after close examination of this one, I find much to my surprise that the doggoned thing is lousy with little backdrafts, with a few flowers which are sitting up on little stems. My first reaction was to throw in the sponge, but I would like a little information on just how to go about picking up these little flowers, etc.

Sincerely,
Sam

Dear Sam:

Like most brass foundrymen I know and have known, you are equipped with the nerve of the proverbial brass baboon. The field of art casting is for the most part a specialty and is full of tricks requiring lots of experience.

The system most commonly used for making a casting with undercuts, such as your bas-relief, is called false coring. Each recess or undercut is filled with sand in such a manner that it leaves a print on the main face of the mold where it can be attached. These portions have to be made so that the main face of the mold can be lifted from the face of the pattern without breaking or tearing up. At the same time, each false core must be made so that it can be removed from the pattern without damage to it and then be placed in its proper print on the mold face.

French sand is used extensively for this type of work because it can be rammed hard and can be dried hard without fear of blowing, etc. French sand—the real McCoy—comes from a little town near Paris. Yankee sand is what often is called synthetic French and also is used widely for fine work. In fact, I have seen Yankee sand do just as well as French. With either sand, if the whole mold is put up, it should be rammed carefully and hard, washed with plumbago, and oven-dried clear through. If Yankee or French is used as a facing, skin drying alone will suffice.

French sand has a grain fineness of 140 to 175 with the clay removed, carries about 16 per cent clay substance, has a permeability of 18 at 7 per cent moisture, and averages green compression strength of about 10. With Yankee sand, grain fineness is about 184, clay content about 19.5 per cent, permeability approximately 17, and green compression

CALIFORNIA FOUNDRY reports

DAVENPORT HANSBERG *Shooter*® 500%

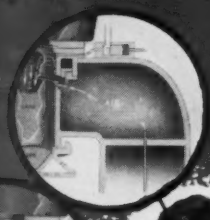
increased core production over former method

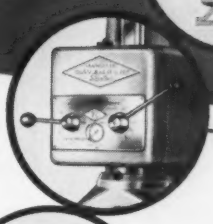
Quality and uniformity showed great improvement.

MANIFOLD CORE
No vent or blow holes used in the body of this core, which is impossible in core blowing.

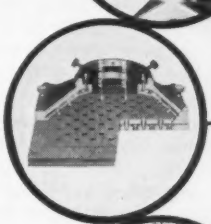
1 AIR STORED DIRECTLY BEHIND SAND
No diaphragm valve or pipes to choke shoot effect. Therefore unparalleled ramming effect with least possible air consumption.

2 LARGEST POSSIBLE ANNULAR RING-VALVE
(U. S. Patent) permits full air pressure to explode upon sand in shortest possible time (shoot effect). Air does not get time to go through sand as in blowers, but stays behind sand, therefore no sandblasting.

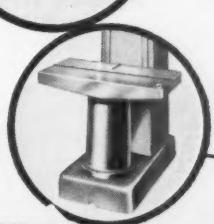




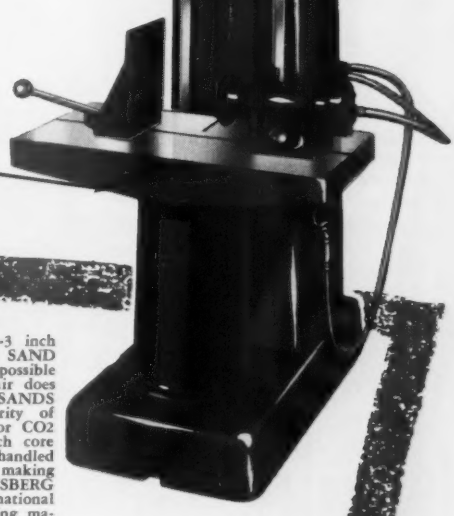
3 ONLY TWO CONTROL LEVERS. Left handle for hydraulic adjustment of table height (also hydraulic draw of core box). Right handle, semi-automatic for horizontal and vertical clamping and shooting. (Push button cycle timing is also available.)



4 SHOOTER HEADS are quick interchangeable with 3 types available — UNIVERSAL HEAD, STANDARD HEAD or SPECIAL HEAD — Built to meet special core specification.



5 RAPID CHANGE OF CORE BOXES. Adjustable table height hydraulically operated, telescoping cylinders, hydraulic AND air operated with 12 inch hydraulic and 7 inch air draw.



ADDITIONAL FEATURES

AIR CONNECTION requires only 1 inch pipe line as compared to 2½-3 inch diameter pipe lines for same size blower — Low air consumption. STOPS SAND BLASTING of core boxes — longer life of equipment. Wooden boxes possible without special attachments. VENTING is simplified since the propelling air does not mix with the sand and only atmospheric air is removed from core box. SANDS WITH EXCEPTIONAL GREEN STRENGTH can be used with majority of core boxes. High green strength sands, oil sands, molding sands, sands for CO_2 PROCESS, shell molding resin sands, resin cereal core sands, pelleted pitch core sands etc., — which are either difficult or impossible to BLOW, can be handled by "SHOOTING". "SHOOTING" is the ADVANCED METHOD of making foundry CORES more uniform, in less time, at a lower cost. HANSBERG "SHOOTERS" is a patented method of shooting cores and at the International Foundry Exhibition held in Germany this "Core Shooter" was the outstanding machine displayed — (over 4,000 are in operation).
FIVE SIZES — "DAVENPORT SHOOTERS"
built in 5 sizes, capacities 4 - 17 - 42 - 88 - 250 pounds.

The term "Shooter" is a registered trademark of Davenport Machine and Foundry Company.

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Davenport, Iowa, U.S.A.

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the most versatile
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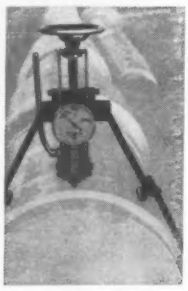
accurate
on-the-spot
tests!



You save time and money on all Brinell tests with the King Portable. It provides hardness tests on all metals from softest lead to toughest alloys having over 700 BHN.

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Circle 681 on Page 51

strength runs to an average of 16.

Should your bas-relief be flat-backed, as most of them are, the cope is made up flat on a good, smooth, level board, struck off, and rolled over on a bed. The pattern then is placed on the cope in the correct position for ramming the drag with the rococo face up. The next move is to study the arrangement carefully and decide about the type of false cores necessary.

Each is made by carefully ramming into the undercuts, bearing in mind that they later must be removed and reassembled on the drag face of the mold in their correct position. Use wires, metal lifters, etc., where necessary. Often because one undercut is above another, one false core requires one or more false cores itself.

Make sure that each false core has a sufficient print to locate it correctly with respect to the finished drag. Each false core must have correct draft to allow the drag to be rammed up and removed in good shape. (It should be remembered that if your piece has rococo and backdrafts on each side, the procedure is the same with the exception that you have to use an odd-side double roll, treating each side singly.)

After all the false cores have been made, they are marked in such a manner that they will leave an indentifying mark on the drag for relocation. The face is dusted with parting, and the drag flask is placed, carefully rammed up, struck off, and a bottom board rubbed in place. Drag and bottom board are lifted off and rolled over on rails. The false cores then are fished from the undercuts and glued or nailed into their correct positions on the drag face. The rest is as usual—skin dry, oven dry, or use whatever other system you prefer.

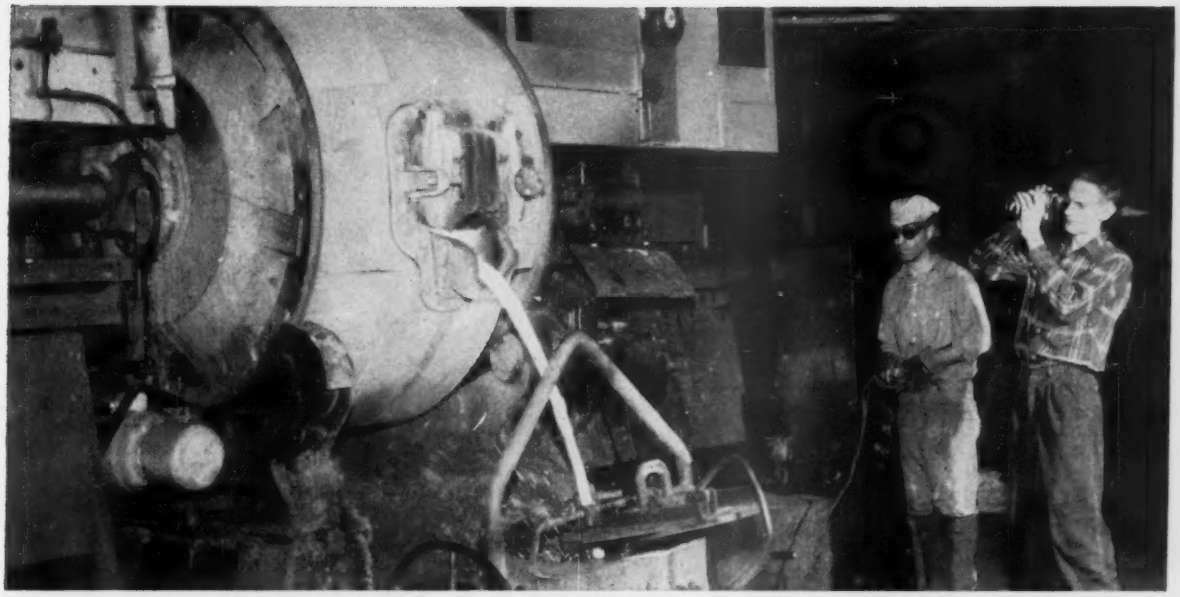
Some operators make up their false cores and bake them with infrared lamps just where they are, on the face of the pattern, before they ram the drag. This procedure is O K. and can be used with French, Yankee, or oil-sand cores provided that the pattern is made of a material which will take the heat. A wooden soldier here and there, cut so as to give both a print and a handle by which to handle the false core, sometimes can be used to an advantage.

I have seen some old French patterns carved in mahogany which were loaded with rococo and gingerbread which in turn looked loaded with undercuts and backdrafts, but were only optical illusions. You no doubt have seen the Jenny Lind candlesticks on Royal Street. Well, there is one full of lace, etc., which could be molded any way you like. This type of patternmaking I think, is as much an art as molding one with undercuts. To create the illusion of folds and undercuts without actually having any is my idea of being real clever.

I also have seen the old cup, saucer, and spoon made with false cores in a two-part flask. Try it some time, Sam.

Sincerely,
Charlie

DEDICATION: Brush Beryllium Co., Cleveland, dedicated its new beryllium plant at Elmore, Ohio, Nov. 18. The plant produces vacuum-cast ingots at the rate of 10,000 lb a month plus 20,000 lb of beryllium in hydroxide which is used in alloys, oxide refractories, and other compounds. Shown at the dedication, left to right, are: H. Chapman Rose, company secretary; Bengt R. F. Kjellgren, company president; Dr. C. Baldwin Sawyer, chairman of the board; Dr. John R. Dunning, dean of the College of Engineering, Columbia University, and the Hon. Harold S. Vance, member, United States Atomic Energy Commission



A heat of alloy iron being poured from a 1500-lb. capacity Type AAH Detroit Electric Furnace in the Westinghouse foundry.

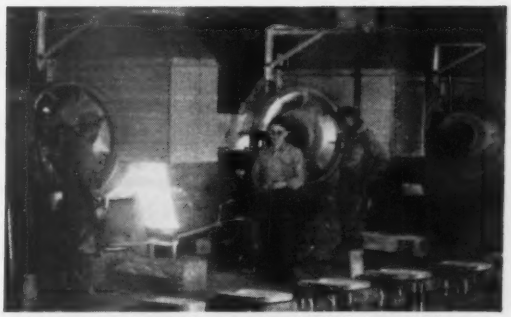
Nine Detroit ROCKING Electric Furnaces Melt Brass and Ductile Iron for Westinghouse Air Brake Co.

Brass, ductile iron, gray iron and special alloys are melted in the nine Detroit Rocking Electric Furnaces at the Westinghouse Air Brake Division foundry.

Whether your foundry produces one product or a variety of metals and alloys, Detroit Electric Furnaces can provide melts of consistent high quality and do it economically.

Detroit's indirect arc melting and automatic rocking action assure homogeneity and close analysis control through heat after heat. Using quickly interchangeable shells, a single Detroit Furnace can melt different alloys with a minimum of downtime. Simply exchange shells, set the desired melting cycle and the furnace is ready for charging. You get full utilization of furnace capacity plus high quality results.

Send us your operating data and our engineers will show you how Detroit Electric Furnaces can best meet your melting requirements.



A battery of six 750-lb. capacity LFYH Detroit furnaces melt bronze of more than a dozen specifications.

A Westinghouse man records a heat of ductile iron melted in Type AAP Detroit Furnace with motorized electrodes.

DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • Bay City, Michigan

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Silicon Determination in Tool Steels, High Alloys

By W. B. SOBERS, Chief Chemist
Chain Belt Co., Milwaukee

ADDITIONAL investigation on application of the colorimetric method to silicon determination in ferrous alloys has resulted in an extension of the procedures described in "Colorimetric Determination of Silicon in Iron and Steel" which was presented in the October issue of FOUNDRY, Page 234.

This latest work relates to silicon determination in tool steels containing tungsten, and in heat-resisting nickel and cobalt-base alloys containing chromium, molybdenum, columbium or niobium, aluminum, tungsten, less than 5 per cent iron, and less than 1 per cent silicon. The procedure follows:

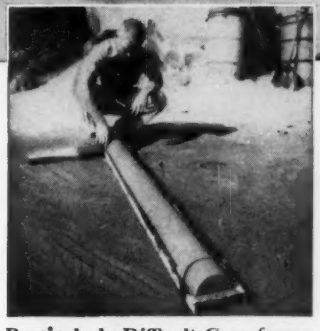
Weigh a 100 milligram sample into a 150-ml beaker. Add 20 ml of hydrochloric acid (conc.), cover beaker and boil gently for a few minutes. To the hot solution add several drops of nitric acid (conc.) and reheat until sample is dissolved. If sample is not dissolved, add a few more drops of nitric acid until sample is dissolved (add more hydrochloric acid if necessary to maintain volume at approximately 15 ml). Avoid excess of nitric acid in dissolving sample, as this subsequently causes fading of the colored silicon determination.

After Sample Has Dissolved

After sample is dissolved, take remaining solution to low volume, 8 to 10 ml, dilute to approximately 50 ml with hot water, boil for two or three minutes and add a slight excess of potassium permanganate solution. Boil for two or three more minutes. The solution is then reduced with a slight excess of sodium sulfide solution. Boil three or four minutes more and remove from heat.

If tungsten is present, filter, catching filtrate in a 200-ml volumetric flask. If tungsten is not present, dilute and transfer directly to a 200-ml volumetric flask, dilute to mark and mix (1 ml equals 0.5 milligrams). Take two 20-ml aliquots (10 milligrams), one for the blank and one for the sample. To the blank and sample solution add 10 milligrams of silicon-free iron solution from a standard sample previously prepared as outlined under procedure "A." Finish coloring the blank and sample solutions as previously outlined under procedure "A."

Apply steel curve and multiply the results by two to find per cent silicon.



Particularly Difficult Core forms downspout for building drainage. "Thanks to excellent dry strength of Cities Service Delco #936 Core Oil, we never have problems," says Dallas.

Pipe This! Dallas Foundry makes thousands of castings for water pipes. Same Cities Service Core Oil—Delco #936—is used to make cores for these as for small cores in main illustration above.

"One core oil for all whether big or small"

All jobs go to Cities Service Delco #936 at Dallas Foundry, Dallas, Texas

Well known for its municipal, industrial, and structural castings, Dallas Foundry's daily tonnage runs about 20-25 tons.

Yet while its castings are by no means the same, its core oil is always the same . . . Cities Service Delco #936.

"This one oil does all our jobs perfectly and eliminates error of application and storage problems often encountered with several oils," says Vice President R. G. Whittington.

"Excellent service has further reduced storage. Sometimes we're able to stock only one barrel of Delco #936, knowing that we can have an order delivered by Cities Service in six hours or less."

Mr. Whittington has added his voice to the growing number of foundrymen who report outstanding service, quality, and range of application with Cities Service Delco Core Oils.

If you'd like the full story of these unique core oils along with a recommendation of which is best for you, talk with a Cities Service Lubrication Engineer. There's no obligation. Or write: Cities Service Oil Company, 20 North Wacker Drive, Chicago 6, Illinois.

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Circle 684 on Page 51

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Whirl-Air-Flow pneumatic conveyor systems transport all types of Foundry sands and cast iron chips through dust tight pipes to required location. Sands are aerated and partially cooled without segregation or loss of moisture.

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Circle 685 on Page 51

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machined all over
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the needs of
your foundry

Write or phone for further information

Anderson Pattern Inc.
MUSKEGON
MICHIGAN

Circle 686 on Page 51

Technical Discussions at the German Foundry Convention

At the annual convention of Verein Deutscher Giessereifachleute (Association of German Foundrymen), many phases of foundry practice were covered as well as mechanization and automation. Included in the papers were the following: "Carbon Dissolution in Austenite of Cast Iron Alloys and Their Significance for Heat Treatment," Dr.-Ing. J. Motz, Frankfurt; "Results of Recent Studies at the Cupola," Dr.-Ing. habil. W. Patterson, Aachen; "Automation Problems in Foundries," Direktor P. Schiegries, Hilden; "How To Achieve Maximum Mechanization and Automation in Foundries," Dipl.-Ing. H. Bergmann, Durlach; "Studies on Working Conditions in Foundries," Dr. phil. H. Scholz, Dortmund; "Casting Fluidity Testing in Foundries," Dr. V. Kondic, Birmingham.

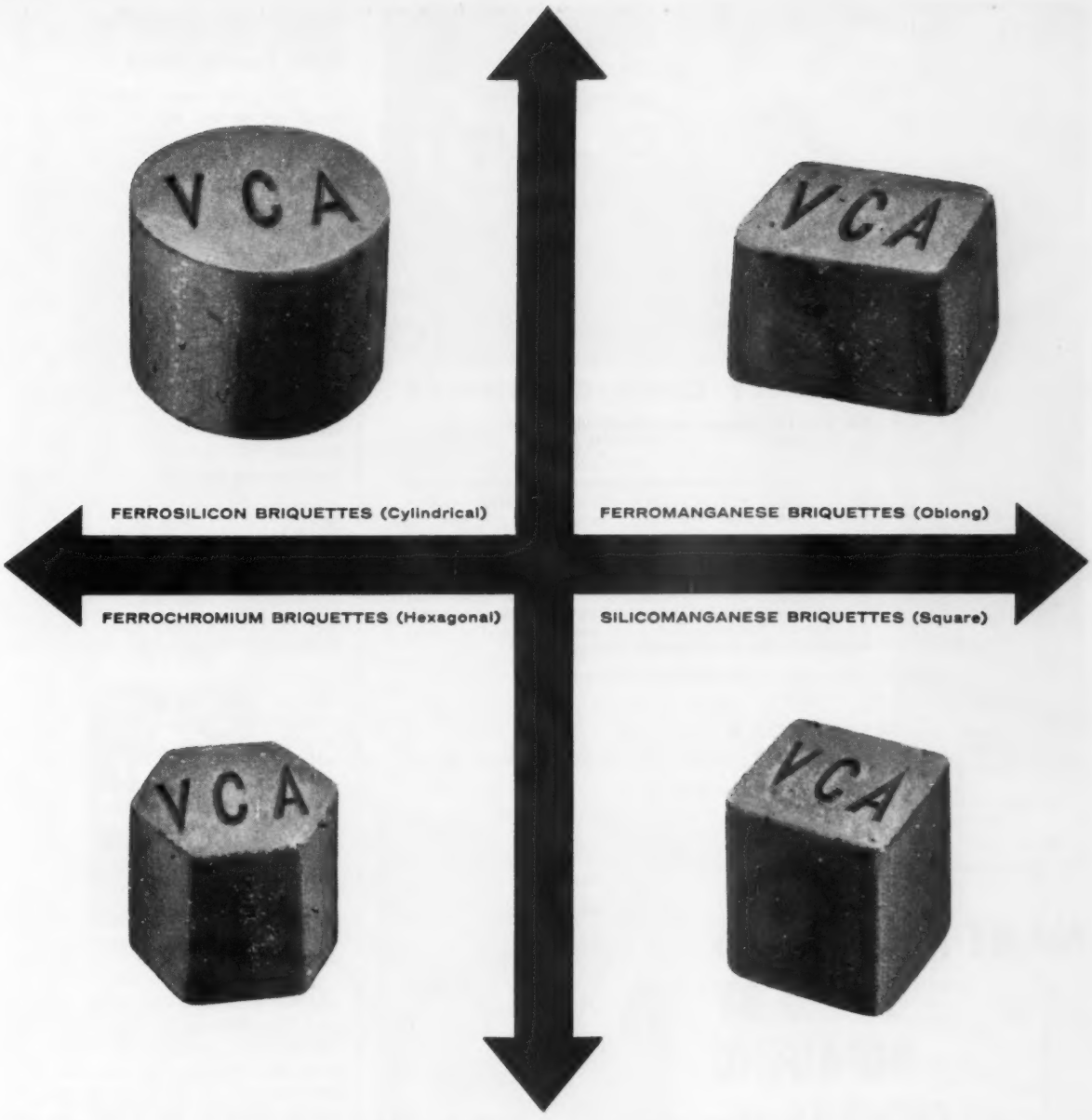
Others included "Training of the Foundry Foreman, Gewerbeoberlehrer L. Frede, Essen; "Studies on the Casting Surface," Oberbaurat Dr. phil. F. Roll, Duisburg; "Superheating Influence on Nucleus Formation in Metal Meltings," Prof. Dr. phil. E. Scheil; "How To Avoid Microporosity in Sand Castings and Permanent Mold Castings of Mg-Alloys," Dipl.-Ing. P. Spitaler, Nachrodt.

"How To Apply External Cooling in Production of Cast Steel Products," Dipl.-Ing. A. Roth; "Perils of Foundry Dust," Prof. Dr. K. G. Schmidt, Bonn; "Attempts To Make Economic Mass Binders," Physiker M. Lottermoser, Hamburg; and "Die Casting Molds and Their Stress Problems," Direktor Obering. G. Lieby, Stuttgart.

Two-Day Conference To Discuss High-Strength Steels

Steel for atomic energy will be among the subjects of technical papers at a regional conference in Pittsburgh, May 5 and 6, 1958, of the Iron and Steel Division and the Institute of Metals Division of the Metallurgical Society, American Institute of Mining, Metallurgical, and Petroleum Engineers.

The general theme of high-strength steels will stress special applications, such as for aircraft. The sessions will cover "Environment of Uses and Required Properties," "Factors in Structure and Composition of Steels Leading to Desired Properties," "Air Melting of Super-Duty Steels," and "Special Steel-making Practices."



ANY WAY YOU LOOK AT IT, VCA *is headquarters for every major type of briquettes!* Briquettes are the easy way to avoid errors in alloy additions to cast irons. And to make alloy addition even *more* reliable, insist on Vancoram Briquettes! They set the standard for quality and uniformity of composition. Vancoram Briquettes are available in bulk, or in bags or pallet boxes for easy storing and handling. The VCA representative in your locality can tell you more about Vancoram Briquettes—or call these distributors of Vancoram products for the iron foundry:

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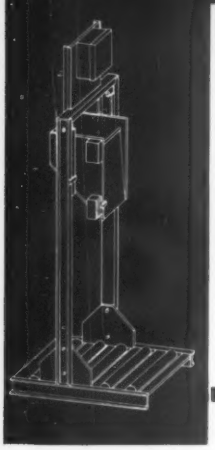
Circle 642 on Page 51



HARTLEY CASTING COUNTER

First of its kind. Eliminates scale counters, weigh count errors, skipping or double-counting.

Forgings, castings, machined parts of any weight or size, within limits of 10" x 15" gate, are counted with speed, accuracy and ease. Chute may be raised for counting pieces too large for gate or which require special handling. Drops castings directly into box, barrel or other shipping container. Heavy duty, rugged, dependable. Not affected by jolting, vibration or dirt.

Combines inspection and counting . . . counting costs nothing!

Above photograph shows battery of Hartley Casting Counters at Neenah Foundry Company, Neenah, Wisconsin. Castings are inspected, counted and barreled in same operation. Third counter from left has counter chute raised for counting large castings. Easily installed, minimum space required!

Complete particulars sent promptly.

HARTLEY *Controls* CORPORATION • Neenah, Wisconsin

Circle 688 on Page 51

MANY MAN HOURS SAVED BY REPAIRING CUPOLAS the "CEMENT GUN"® way

The CEMENT GUN is simple to operate; two or three of your own men can learn quickly and easily, after which they can make all your cupola repairs. With the CEMENT GUN they can place a lining 1" to 6" thick in one continuous operation. They can make patches in a "hot" furnace. They can place up to 5 thousand pounds of refractory material an hour. The CEMENT GUN method saves down time, saves material and extends the life of your present linings. Write today for our FREE bulletin #3000 and check our claims.

CEMENT GUN COMPANY

"GUNITE"® CONTRACTORS

1520 WALNUT ST., ALLENTOWN, PA.

Circle 689 on Page 51

Gray Iron Founders Plan Sales Training Clinics

A three-day series of working sessions is planned by the Gray Iron Founders' Society, National City-East Sixth Bldg., Cleveland 14, at a sales training clinic for gray and ductile iron castings salesmen to be held in Cleveland, Chicago, Philadelphia, San Francisco, Milwaukee, St. Louis, Cincinnati, and Hamilton, Ont., Canada, in January and February, 1958.

First of their kind for gray iron foundrymen, the clinics will be directed by Richard C. Meloy, marketing director, and Charles F. Walton, technical director of the society. Classes will be limited to 25 men to facilitate participation by registrants

and to assure personalized instruction. Subject matter will cover the information desired by buyers of gray iron castings, as revealed in a nationwide survey of purchasing agents made by the society, as well as industrial selling techniques.

Each registrant will have his toughest individual sales problem analyzed, and solutions will be suggested. Under the heading Product Knowledge-Technical, salesmen will study metallurgy, properties, design, pattern equipment, cast processes and competitive materials. Under Product Knowledge-Company, individual company objectives will be developed, and sales presentations will be worked up to cover policies, services, costing, engineering assistance, etc.

Marketing and selling programs will be studied, and salesmen will be instructed where to find potential customers, how to qualify them, and how to find various sources of leads;

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Circle 690 on Page 51

practice sessions will help the men put polish on their own presentations, and written examinations will reveal the need for more knowledge. Registration fee of $75 will include technical and sales textbooks, copies of instructors' talks and cost of the luncheons.

Conveyor Manufacturers Elect Officers and Directors

New president of the Conveyor Equipment Manufacturers Association is E. P. Berg, general manager, Link-Belt Co., Chicago. Mr. Berg was elected at the 24th annual meeting of the group at Point Clear, Ala. Other officers include the following: Vice president, J. B. Nordholt Jr., Webster Mfg. Inc., Tiffin, Ohio; treasurer, H. E. Murken, Hewitt-Robins Inc., Stamford, Conn.; and secretary, L. J. Johnson, Mathews Conveyer Co., Ellwood City, Pa.

Directors are O. A. Johnson, Gifford-Wood Co., Hudson, N. Y., E. E. Saperston, Mechanical Handling Systems Inc., Detroit, and L. E. Brill, Jeffrey Mfg. Co., Columbus, Ohio. O. A. Johnson was appointed to fill out the unexpired portion of the term of R. Y. MacIntyre, who resigned last summer. Mr. Brill was elected to serve the remaining year of Frank J. Shude. R. C. Sollenberger continues as executive vice president of the association.

Planning Is Key to Production Control, New Group Is Told

"Reduced overhead costs can be achieved by replacing the stock-chasing, expediting, firefighting method of production control with sound, effective planning," Hugh D. Luke, Reliance Electric & Engineering Co., Cleveland, told the charter meeting of the newly organized American Production and Inventory Control Society in Cleveland.

Society officers elected at the charter meeting include M. W. Maddox, Mueller Brass Co., Port Huron, Mich., president; R. Elliott Carruth, Acushnet Process Co., New Bedford, Mass., vice president; Don Burkhart, Haynes Stellite Co., Kokomo, Ind., secretary; and Louis Norheimer, Tube Turns, Louisville, treasurer.

Steps were taken to establish geographical regions to further the founding of and service to local chapters.

It also was announced that some existent local groups have taken action to join the society. About 60 companies already are charter members.

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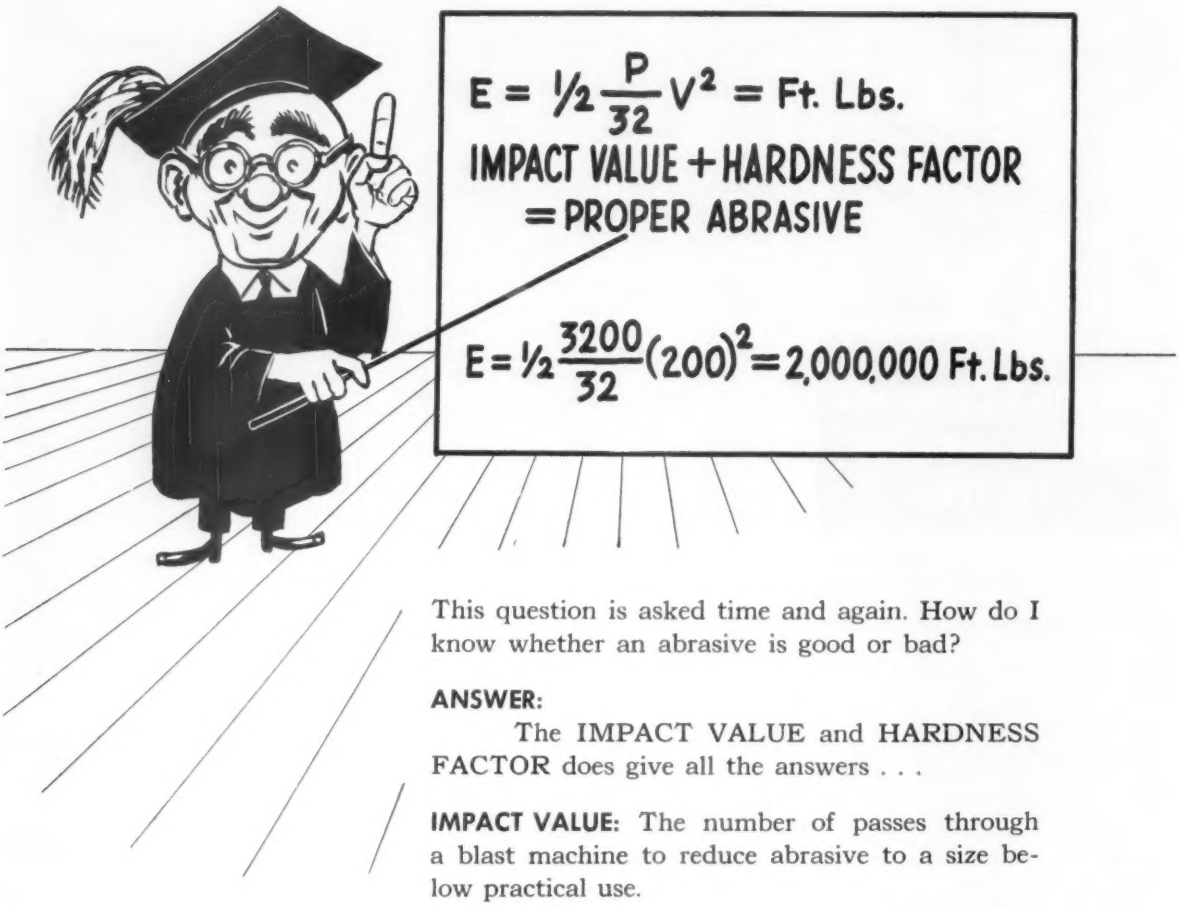
Circle 691 on Page 51

What really counts in blast cleaning abrasives?


$E = \frac{1}{2}\frac{P}{32}V^2 = \text{Ft. Lbs.}$
IMPACT VALUE + HARDNESS FACTOR
= PROPER ABRASIVE
$E = \frac{1}{2}\frac{3200}{32}(200)^2 = 2{,}000{,}000 \text{ Ft. Lbs.}$

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Obituary

JOHN P. FREY, 86, for 24 years editor of the *International Molders Journal* and recently president emeritus of the Metal Trades Division of the American Federation of Labor, died in Washington, Nov. 29. A native of Mankato, Minn., Mr. Frey was a 22-year-old iron molder in Worcester, Mass., when he became the country's youngest president of a local union. He was elected a vice president of the International Molders Union five years later, and held posts as an international union officer for the next 50 years.

Guy N. Harcourt, since 1945 associated with Blaw-Knox Co., Pittsburgh, died Nov. 20. A graduate of Massachusetts Institute of Technology, he became head of the Buffalo Foundry & Machine Co.'s New York office about 20 years ago. Later he went to Buffalo as vice president-engineering and a director of the plant there. When Buffalo Machine became Buflovak Equipment Div., Blaw-Knox Co., Mr. Harcourt remained with the concern and 4 years ago was sent to England to organize the British division. He returned last year.

Christian Birnbaum, 89, president, Cleveland Standard Pattern Works, Diebold Products Co., and Ohio Piston Co., all of Cleveland, died there Nov. 19. A native of Germany, he came to the United States in 1882, opening the pattern works in 1897. In 1917 he acquired Ohio Piston Co., and took over Diebold Products in 1920. Mr. Birnbaum retired in 1951.

Thomas Robins, 89, founder and former chairman, Hewitt-Robins Inc., Stamford, Conn., died Nov. 4. A pioneer in the field of troughed belt conveyors, in 1896 he founded the company which merged with Hewitt Rubber Co. in 1945 to form the present firm.

John J. Dowdle III, 39, since 1951 a vice president, Great Lakes Carbon Corp., New York, died Nov. 11. He joined the company in 1945, became sales representative for the company's electrode division, and in 1950 was named special assistant to the president.

Joseph J. White Jr., metallurgical and research associate, Erie Forge & Steel Corp., Erie, Pa., died Oct. 20.

Houston I. Hiatt, 84, former sales manager, National Malleable & Steel Castings Co., Chicago, died Nov. 20. He retired 14 years ago after 43 years with the company.

Albert J. Griffa, 85, founder, Standard Brass Foundry Co., Cleveland, died Dec. 3 in Mantua, Ohio, where he had made his home since 1912. He founded the company in 1900.

Henry Kingsbury, 74, former chief engineer, Hammond Machinery Builders Inc., Kalamazoo, Mich., died Oct. 18. Mr. Kingsbury had been associated with the company over 50 years.

Daniel H. Redmond, 85, co-founder and treasurer, Fairmount Foundry Inc., Philadelphia, died Nov. 22.

Book Serves as Pocket Guide to Better Diecasting Practice

Henning Bros. & Smith Inc., 91-127 Scott Ave., Brooklyn 37, N. Y., have published a revised edition of "Die Casting with Zinc Base Alloys." The booklet contains data on factors which influence production of sound zinc alloy diecastings with good surface finish.

These factors include alloy composition, standard specifications, temperatures, metal injection pressures, gating, venting, quenching, and care of dies and machines. Common die casting defects, what causes them, and how they may be avoided also are covered.

Book Review

Automation in Practice, by S. E. Rusinoff, 5½ x 8½ in., 261 pages, published by American Technical Society, 848 East 58th St., Chicago 37, Ill. Price $6.50.

The intent of this book is to provide an integrated survey of the latest automation techniques as they actually are applied in various manufacturing and metalworking processes. The emphasis is on practice. Material is treated primarily in terms of particular processes rather than in terms of particular industries or particular products. In this book, automation is dealt with in terms of three basic functions of production—materials handling, processing, and quality control. All three functions are considered at length.

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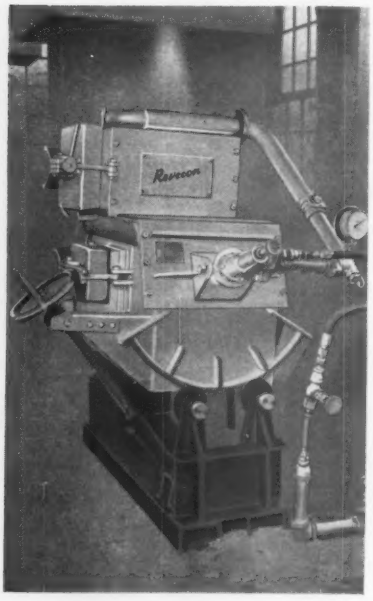

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Circle 694 on Page 51

By W. K. BOCK
Director of Research
National Malleable & Steel Castings Co.
Cleveland

MASS PRODUCTION
. . . It Began in a Foundry

IN 16th century Milan, Italy, a foundryman lived who may have invented mass production and who certainly practiced it. No, this is not going to be a fairy tale. It will be a comment on a historical record, and for the foundryman with pride in his occupation, it will be a pleasant comment.

Mass production may be defined as the making of a large number of units of production rapidly and with few manhours of labor per unit. Although the modern foundry is a part of the mass production system, its role is not appreciated fully. To anyone who has seen a punch press or an automatic screw machine spitting out parts in seconds with little attention from an operator, the production pace in even a mechanized foundry must seem downright leisurely.

Although machine tools were available before the automobile industry began, that industry made such extensive use of mass production that Detroit is considered by many to be the birthplace of mass production.

Where To Start — If a historian were interested in the development of mass production, where would he start his research to find the first application of the idea? Should he start the Seldon's patent of 1895 since this patent is considered the basic patent of the automobile industry? Or would it be better to go back to the first machine tools, perhaps beginning with Wentworth's work about 1830? Machine tool history is rather vague as to its beginning, but all such machines require motive power; so perhaps the search could begin with Savery's patent for the steam engine in 1698.

How about starting with the foundry industry about 1500? If our historian accepts the idea that mass production is tied up with machine tools or that it is a by-product of the automobile industry, he may find this suggestion ridiculous. Mass production before machine tools may sound absurd, and mass production antedating the automobile and even Detroit itself may be equally difficult to understand.

Four Centuries Ago—No matter how unlikely the idea of mass production in a medieval foundry may sound, one of the first, if not the first, references to mass production occurs in *De la Pirotechnica* by Biringuccio (Book I, Chapter VIII). The publication date of the first edition makes it certain that mass production was going on in 1540—and probably earlier.

A brass foundry in Milan at that time specialized in the production of small castings like buckles, window fastenings, harness parts, thimbles, chains, bells, and other objects. The molding material was clay, loosened by the addition of wool clippings and perhaps by other ingredients. Moisture content was regulated carefully. A block of clay about 1 in. thick was made, and a loose metal pattern was pushed into the plastic clay to form the drag. Vents and sprue were cut in, and the drag and pattern were heated to harden the clay.

After the parting surface had been dusted with coal dust, another block

of clay was pressed onto the first with the pattern in place. Another pattern like the first was pushed into the top of the second block. After the sprue had been cut through the clay, the second block was baked to harden it enough to handle. This stack molding was continued until a stack of about 20 molds had been prepared. Finally, the molds were patched where necessary, the stack was assembled, wired together, and then thoroughly baked before pouring.

Meanwhile, the brass heats were made by the then current practice of reducing zinc oxide in the presence of molten copper.

Each pattern was made up of the gating system and 20 to 60 castings, depending on the object being produced. Thus a single stack produced 400 to 1200 castings for shipment. Biringuccio notes that in this one foundry, eight men working a single shift could produce in one day enough window latches or buckles or other castings to fill the demand not only of Milan, but of all Italy for some time.

A Natural Beginning—When the fact of this early application of mass production is presented, it starts a chain of thought which makes the foundry the logical place to look for the origin. Mass production is a principle, first of all. When the principle is recognized, it is reduced to practice by adopting existing machines and methods to carry out the concept. It develops by the design of new machines and the invention of new methods. The idea of mass production must have occurred to many people. Since casting is the oldest industrially important method of shaping metal, the foundryman was in the best position to have the background to carry out the idea.

The author was so interested in this operation that he said he visited this foundry to watch production every time he visited Milan. This reaction sounds much like that of the present-day tourist whose visit to Detroit is not complete if he does not spend some time gawking at one of the final assembly lines.

Biringuccio was no greenhorn in a foundry. He left us a rather complete description of the process, but he did make some glaring omissions. He was as profit-conscious as any modern foundryman, but he said not a word about cost savings or profits from mass production.

An even more glaring oversight was his failure to record the name of the owner of the foundry. The foundryman-genius thus was deprived of his well earned place in history.

Circle 695 on Page 51

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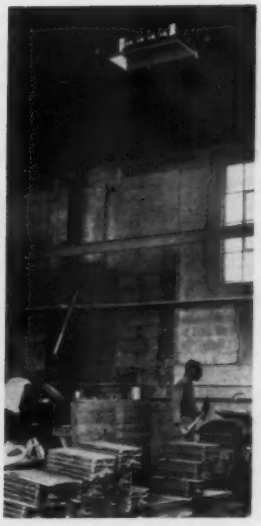
At Huron Mfg. Co., pattern and die shop in Huron, Ohio, 26 infrared generators in 754,000 Btu installation save $36 monthly in gas cost



Fuel savings at AllCast Non-Ferrous Metals Co., Newark, N. J., are 55 per cent a year

Infrared System Efficient in

HEATING HIGH-BAY BUILDINGS

By C. H. FOULDS
Vice President
Perfection Industries
Division of Hupp Corp.
Cleveland

Closeup of infrared generator in typical industrial installation shows component parts

INDUSTRY's need for an economical method of heating such high-bay buildings as foundries, warehouses, and aircraft hangars has increased markedly in recent years. Conventional space heating systems which create a blanket of warm air around a person have become more expensive and less satisfactory as buildings grow in size and heating requirements become more complex. Frequently, as at loading docks and other partially exposed areas, space heating is impossible.

In attempting to solve the high-bay heating problem, industry has tried a number of techniques, the most promising of which has been radiant heating. It heats surfaces and people directly rather than by convection from warm air.

The two most common forms of radiant heating are panel heating and infrared heating from above. The former uses the floor or wall area as a radiator, with the source of heat imbedded in it. This system has gained acceptance in homebuilding and similar applications, but cost considerations have caused drawbacks in industrial use.

This cost factor is largely overcome in overhead gas infrared radiant heating because the source of heat is above the floor rather than inside it, eliminating the need for tubing. Heating technologists for several decades have attempted to capitalize on these advantages, but have been stymied in perfecting a simple, efficient gas infrared generator. The chief problem lay in the fact that the generator's comparatively low operating temperatures did not produce infrared of sufficient intensity. These units utilize a standard gas burner to heat metal strips, tubes, or louvers which emit

infrared energy. This intermediate step in the heat-transfer process—similar to using a heat-carrying fluid such as water or steam in conventional systems—further reduced the generator's efficiency.

Surface Combustion—A radically new approach to gas infrared generation by a German scientist, Guenther Schwank, has promised a solution to the problem. Generators based on his inventions were brought to the United States from Germany and are now being made here under license agreements.

The Schwank technique differs markedly from previous gas infrared generators. One stage in the earlier generation process is bypassed completely by using the structure which supports combustion as the infrared emitter. Since no metal strips or louvers are needed, higher operating temperatures are feasible and a maximum proportion of the Btu input is converted into usable infrared.

An operating temperature of 1650° F is achieved in the Schwank generator by combustion of gas on the surface of a patented ceramic mat. Each ceramic unit is perforated with 200 holes per square inch through which an air-gas mixture feeds. The large number of holes and the physical characteristics of the ceramic material make possible the relatively high surface temperature achieved. Because gas is converted into infrared energy in the wave lengths readily absorbed by most common materials, the generator is considered the most efficient and economical known today.

Building construction varies as shown here and determines mounting arrangements for generators

Warm Floor, Cool Air—Conventional calculations for determining the amount of heat required for comfort heating of a building are not applicable to infrared. Its rays, like those of the sun, warm only the bodies which absorb them and not the air through which they travel. Once the energy waves emitted by the gas generator strike a person in their path or the floor, wall, or machinery, they are transformed into heat.

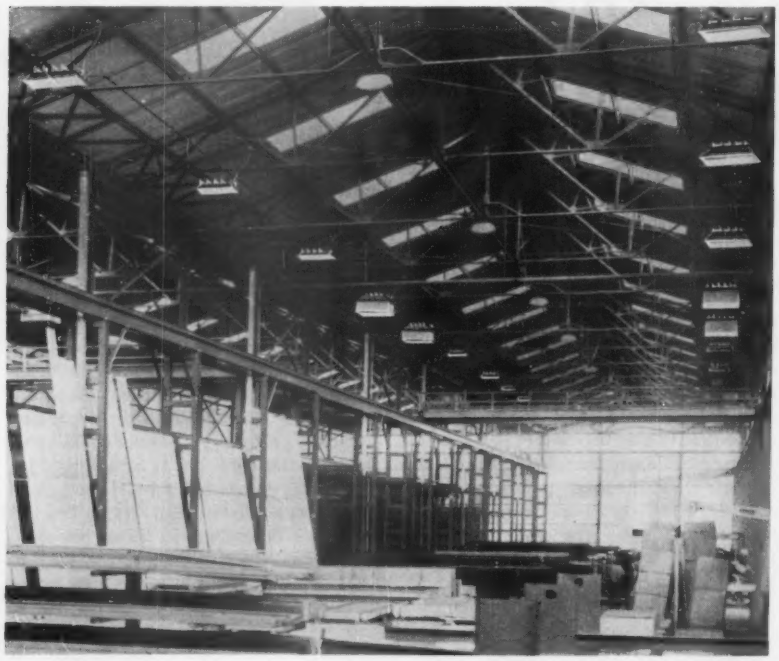
The feeling of warmth created by infrared can be illustrated by stepping from the shade into sunlight on a cool day. The body is warmed instantly while the air remains cool. In an infrared-heated building, a person is warmed by radiation from the generator and by radiation, conduction, and convection from the floor-wall-machinery surfaces, which become radiators themselves. Workmen don't experience a sharp change in air temperature when they go outside or into unheated areas of the plant; tools and machinery are always warm to the touch. Additional advantages are absence of drafts, noise, and odors.

Reduces Heating Costs

Because infrared heat requirements are calculated in square feet instead of cubic feet, no single yardstick can be used to compare performance with conventional space heaters. Generally, gas-fired infrared can lower heating costs by 20 per cent in a building easily heated by other methods. In hard-to-heat buildings, heating costs can be reduced up to 50 per cent. In addition, infrared can provide spot heat in warehouses or other unheated buildings as well as at loading docks and other partially exposed areas. The infrared generators can be installed at any height as low as 7 feet and as high as 60 feet without sacrifice in efficiency. Sidewall mounting of infrared generators is also possible when building design makes it desirable.

Operating Principles—Operation of the new infrared generator on natural, manufactured or liquefied petroleum gas is extremely simple. Gas is metered through an orifice, passes through an air aspirating chamber and a mixing tube to a chamber under the ceramic mat where it is distributed uniformly through the ceramic. This is a 100 per cent primary air burner, requiring no premix or blower.

U. S. - designed gas generators based on the Schwank principle are multiples of an eight-ceramic combination called a "rayhead." These rayheads are grouped in an aluminum reflector which helps direct infrared toward the surfaces to be heated. For installation in high-bay buildings, a large number of ray-



Gas infrared generators in this high-bay steel warehouse maintain an even temperature of 65 degrees all winter despite fog and damp typical of area

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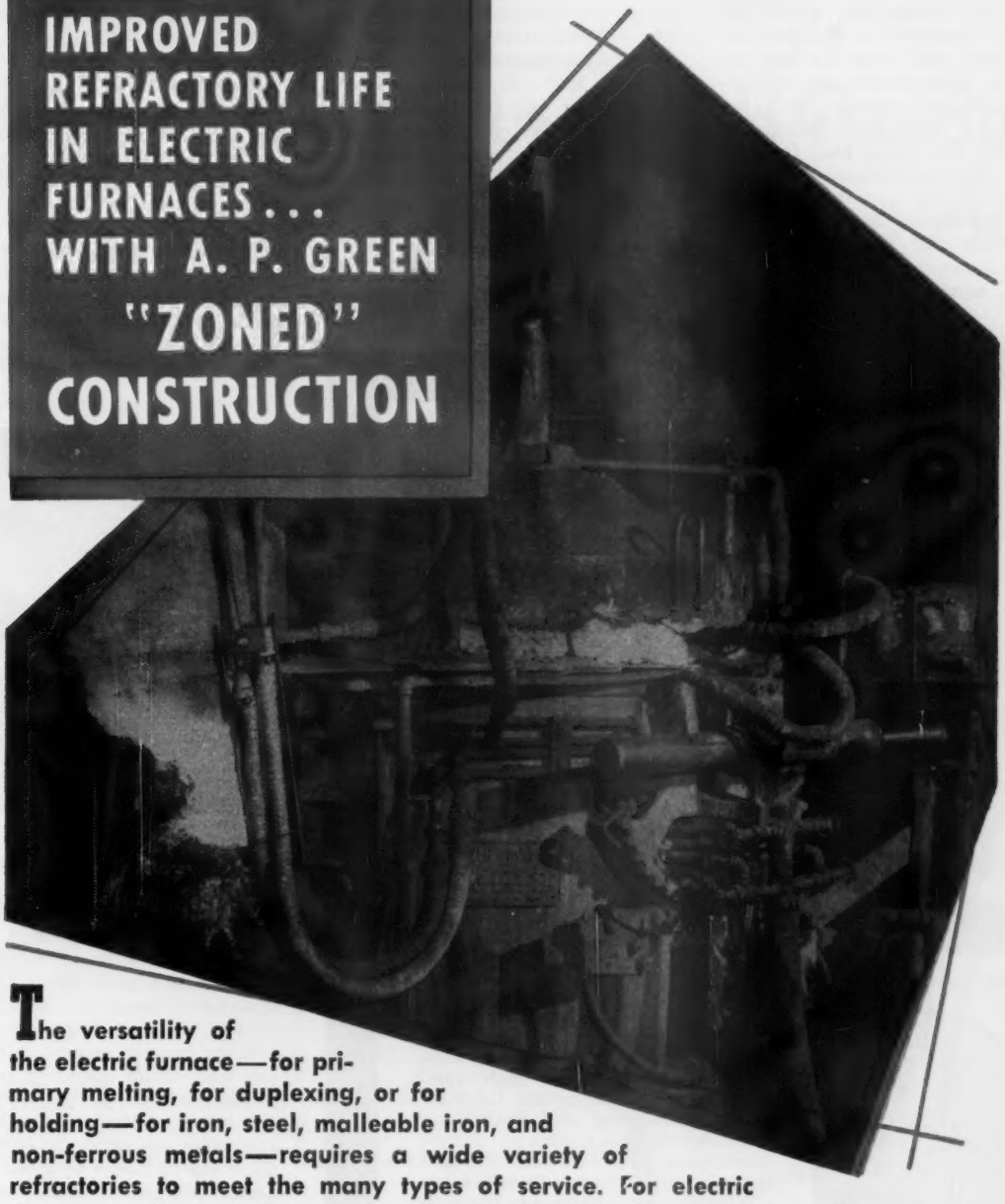

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Circle 697 on Page 51

heads are combined in the same fixture to radiate over a large area.

Generator models for indoor use have been approved by Underwriters Laboratories and American Gas Association. Zone thermostats are normally used for heating; they are hidden from the rays of the generator so that heat rising from the floor controls the temperature. Life expectancy of the unit under normal service conditions is unlimited, with adjustments and repairs seldom if ever necessary.

U. S. Installations—Operating results established in U. S. installations to date are impressive. Following are several examples of the new gas infrared generators in various types of industrial buildings:

Huron Mfg. Co., Huron, Ohio, a pattern shop and metalworking firm, installed 26 infrared generator units in a 754,000 Btu installation for an all-steel building with concrete floor covering 6400 square feet. For space heating, a 1-million Btu system would have been required. Cost of heating this building with natural gas for eight months from October, 1956, through May, 1957, was $1036, or 0.16 cent per square foot.

AllCast Non-Ferrous Metals Co., Newark, N. J., calculated annual fuel savings of 55 per cent by heating a 35-foot-high foundry building with infrared. In addition, the company spot heats an adjacent building used for grinding operations. Fuel cost for infrared amounted to $667.50 per year. In this building, 604 Btu/cu ft mixed gas at 3-in. water column pressure is used successfully.

Graco Steel Co., Louisville, Ky., warms a one-man work station in its large steel warehouse with one portable over-desk gas infrared generator which provides working comfort in a limited area without waste of heat.

Ohio Manufacturers & Fabricators Co. Inc., Elyria, Ohio, heats a 6000-square-foot steel Butler building that opens on two sides into a 1,300,000-square-foot unheated warehouse and welding shop. Thirty overhead gas infrared generators provide comfortable warmth for operating personnel. in the building.

Rolled Steel Products Co., Houston, eliminates corrosion in steel warehouse stocks caused by moisture condensation when humidity rose to 85 per cent during the night. Gas infrared generators, operating three hours per night, maintain steel temperature well above dew point.

Toledo Lakefront Dock, operated jointly by the Baltimore & Ohio Railroad and the New York Central Railroad, uses gas infrared to thaw frozen coal in gondola cars more than eight times as fast as formerly.

Detrex Corp., Detroit, uses gas infrared generators to dry steel sheets after washing in an alkaline solution. Sheets were formerly oven dried at 450° F for four minutes and then allowed to cool. With infrared, sheets are dried in 30 seconds and can be handled immediately.

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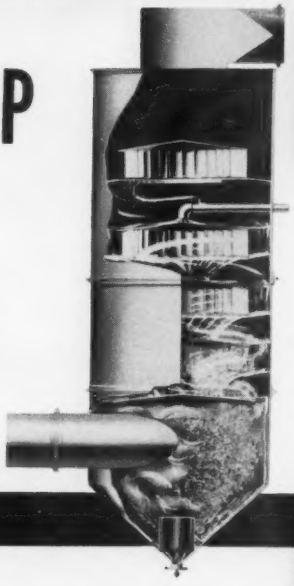

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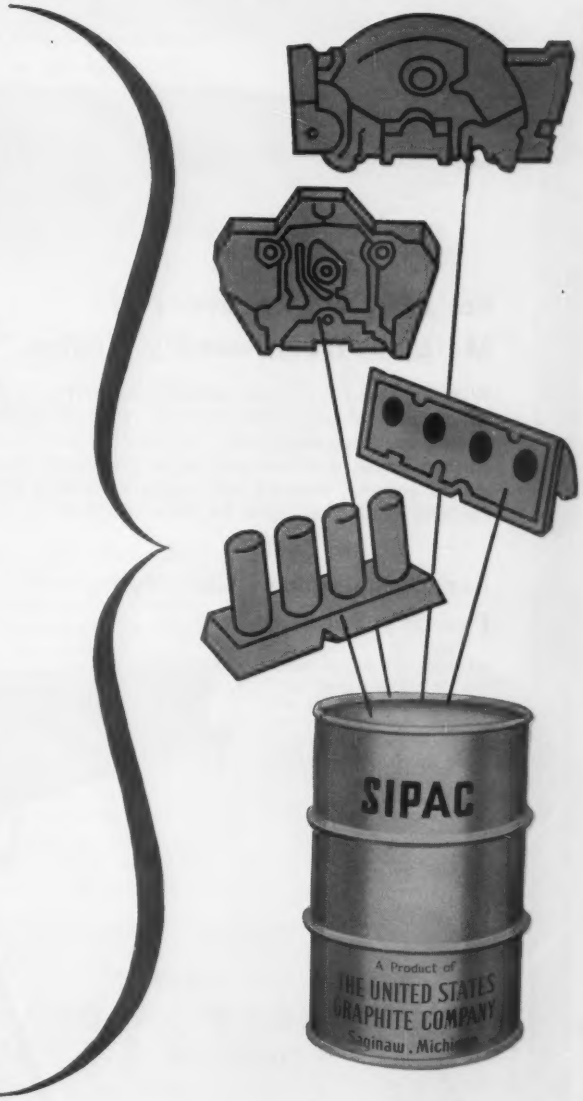

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Circle 640 on Page 51

Foundry Group Meetings

Wisconsin: Hotel Schroeder, Milwaukee, was the location for the Oct. 11 meeting of the AFS chapter. R. L. Gilmore, president and general manager, Superior Steel & Malleable Casting Co., Benton Harbor, Mich., was the featured speaker on the subject "The Advantages of Proper Casting Design." A color movie of the 1957 Indianapolis 500 mile auto race, by courtesy of the Socony Mobil Oil Co., also was shown.

At the Nov. 8 chapter meeting, the Steel section heard discussions on "Basic Concepts of Gating and Risering." M. V. Sporakowski, Falk Corp., and V. E. Siemer, Bucyrus-Erie Co., were panelists, with John T. Pace, Bucyrus-Erie Co., serving as moderator.

The Malleable Iron section was addressed by Earl Woodliff, foundry consultant, Detroit, on the subject "Sand Problems of Special Interest to Malleable Foundrymen." Paul R. Martin, Milwaukee Malleable & Gray Iron Co., was chairman. John E. Mueller, Carborundum Co., Niagara Falls, N. Y., talked to the Nonferrous section on "Save on Snagging and Cut-Off." Harvey M. Zindars was chairman.

"Material Handling Tricks for Everyone" was the subject of Harold B. Zuelke, Allis-Chalmers Mfg. Co., in another session that had Carl J. Risney as chairman. "Engineering Aspects of Corebox Design" was discussed by Richard L. Olson, Dike-O-Seal Inc., Chicago, before another group. Erwin Czerwinski was chairman.—*John E. Hubel.*

Ontario: The AFS chapter met at Hotel London, London, Ont., on Nov. 15 to hear two talks as well as witness a gymnastic demonstration by Miss Ernestine Russell, Canadian gymnastic champion and Olympic representative.

Frank G. Steinebach, editor, FOUNDRY, spoke on "The Future of the Foundry Industry," and offered statistics showing foundry production trends from the beginning of the century. He predicted that in 1975 we shall be shipping 60 per cent more tons of castings than in 1956. He highlighted the statistics with personal reminiscences and stressed that more engineers are needed on the management team, since to survive, the foundry industry must sell castings to replace weldments, forgings, and sintered powder products.

L. N. Schuman, National Malleable & Steel Castings Co., talked about "The Forward Look" and emphasized the importance of having scientists instead of artists in the foundry. He also forecast developments in the melting, molding, and coremaking fields.—*P. J. Provias, International Nickel Co. of Canada Ltd.*

Washington: Walter R. Jaeschke, consulting metallurgical engineer, Whiting Corp., Harvey, Ill., spoke to 21 members of the AFS chapter at Tacoma, Wash., on Nov. 14. Mr. Jaeschke's talk covered the history of water-cooled cupolas and slides illustrated the mechanics of different

For Efficient Recovery of Metallics from Foundry Wastes

With the SuperDuty® table, valuable non-ferrous metallics are reclaimed profitably from foundry residues, machine shop wastes and floor sweepings. The waste materials are simply washed across a riffled deck while the heavy metallics are moved endwise, trapped and recovered quickly at low cost. For full information, send for Bulletin 118-B.

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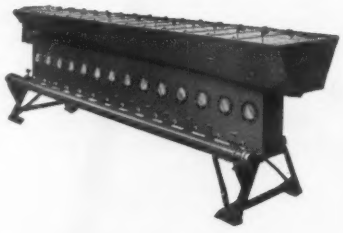
New or used foundry sands are cleaned and sized accurately and economically with the CONCENCO® Constriction Plate Classifier. It sorts sands cleanly and sharply so that the good grain sizes may be recombined according to your specifications. Send for information.



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GLOBE SILVERY IRON FERROALLOYS

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Produced in a blast furnace from an all-virgin ore burden, Globe Silvery contains little or no residual elements.

Globe piglets can be handled conveniently and economically.

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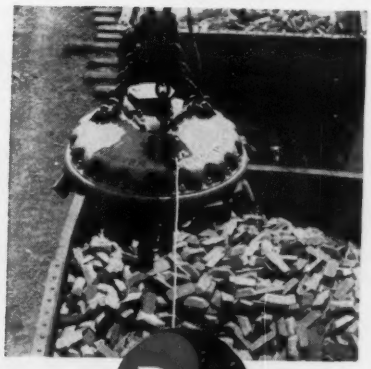

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Circle 701 on Page 51

cupolas of this type that have been used.

The speaker pointed out that water-cooled cupolas are used most commonly in operations where long runs of low-sulfur iron are required for nodular iron practice and in those operations using all scrap to avoid use of pig iron. These cupolas usually employ a 6 to 9-in. lining for a 16 to 18-hr a day operation, using water spray where water temperatures are held to a maximum of 140° F. The bottom is dropped daily. *—Frank H. Jefferson, Frank H. Jefferson Inc.*

New England: About 75 persons assembled at the University Club, Boston, on Nov. 13 at the regular monthly meeting of the AFS chapter. Walter E. Carlson, Carlson Pattern Shop Inc., Springfield, Mass., was the featured speaker on "Patterns and Profits." The talk emphasized the advantages of foundry operators selling their customers the idea of purchasing good pattern equipment.—*Fred S. Holway, Mystic Iron Works.*

Reading: About 50 members and guests of the Reading Foundrymen's Association met Nov. 19 at the Berkshire Hotel, Reading, Pa., and heard Thomas E. Eagan, chief metallurgist, Cooper-Bessemer Corp., Grove City, Pa., discuss "Nodular Iron as an Engineering Material."—*W. I. Cassidy.*

Twin City: "Precision Investment Castings" was the subject of Frank S. Badger Jr., vice president, research and development, Haynes Stellite Co., Kokomo, Ind., at the annual joint meeting of the AFS and ASM chapters at Calhoun Beach Hotel on Nov. 20. Mr. Badger cited the industrial beginning of the lost wax process as the production of turbo supercharger impeller blades in 1941. Present applications were discussed and factors to consider in creating practical investment casting designs were elaborated on.—*J. David Johnson, J. David Johnson Co.*

Northeastern Ohio: Approximately 200 members and guests of the AFS chapter assembled at the Tudor Arms Hotel, Cleveland, on Nov. 14 to hear Warner B. Bishop, vice president, Archer-Daniels-Midland Co., Cleveland, discuss "Which Core Process?". Norman J. Stickney, Sand Products Co., served as technical chairman and introduced the speaker.

E. Claude Jeter, Ford Motor Co., chapter chairman, presided at a short

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Produced in modern electric furnaces at Beverly and Jackson, Ohio, plants, from top quality raw materials, Globe ferroalloys are of highest purity and meet the most exacting requirements.

Shipments are by rail, water, or truck, in lump size or crushed.

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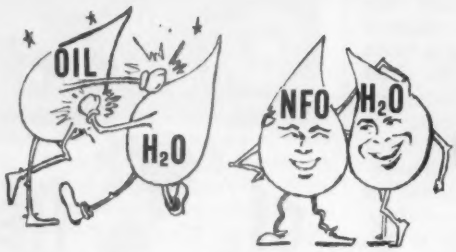
Circle 702 on Page 51

Yes, oil and water DO mix



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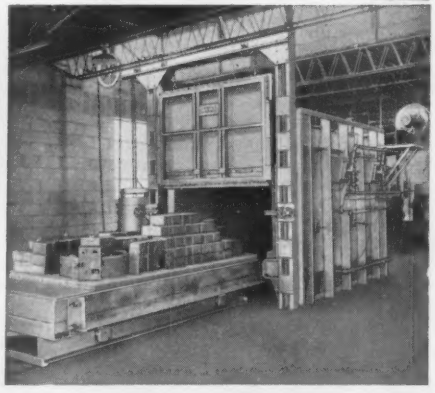
Circle 703 on Page 51

For Normalizing, Annealing and Stress Relieving

JOHNSTON CAR BOTTOM FURNACES



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business meeting following dinner. David Johnson, representing the Cleveland Technical Societies Council, spoke briefly about the Cleveland Engineering and Scientific Center building, now under construction, and its need for additional funds. Robert H. Herrmann, FOUNDRY, reported on the annual Christmas Party and outlined the procedure for obtaining tickets to the affair.

Mr. Bishop discussed at some length the four major coremaking processes available to the foundryman—conventional, shell, gas-setting, and air-setting—and listed the advantages of each method.

The chapter's annual Christmas Party was held Dec. 6 in the Rainbow Room, Hotel Carter, Cleveland. Some 800 members and guests enjoyed the dinner and traditional floor show that followed. — *Kenneth L. Mountain.*

Philadelphia: Before one of the chapter's largest audiences, George F. Watson, American Brake Shoe Co., Mahwah, N. J., talked about "Casting Defects Caused by Sand" at the Engineer's Club, Philadelphia, on Nov. 8. Chairman for the meeting was H. C. Winte, Florence Pipe Foundry & Machine Co., Florence, N. J., chapter chairman. Dan Jones, New Jersey Silica Sand Co., Millville, N. J., was technical chairman. — *E. C. Klank, Philadelphia Coke Co.*

Chicago: Second in its series of four division meetings was conducted by the AFS chapter on Dec. 2 at the Chicago Bar Association. Chapter President W. O. McFatridge, supervisor of foundry laboratory, Manufacturing Research, International Harvester Co., presided.

AFS National President Harry W. Dietert, chairman, Harry W. Dietert Co., Detroit, reported that society membership and finances are in good shape and that next May's foundry exhibition and convention is shaping up to be one of the best. Through education, he said, foundries will make better castings and sell more castings. He reported that the society was gratified to have 453 students enrolled in this year's Training and Research Institute trial courses. More than 300 companies were represented in the enrollment, the majority affiliated with foundries but some coming from foundry suppliers.

Chapter Vice President Don G. Schmidt, metallurgist, H. Kramer & Co., announced the division meetings and introduced speakers and chairmen. Gray Iron and Steel divisions convened jointly to hear Arnold S. Grot, metallurgist, Edward Valves

Circle 704 on Page 51

Inc., Division of Rockwell Mfg. Co., discuss "Gating and Risering for X-Ray and Pressure Quality." Ed Moyer, pattern shop superintendent, Howard Foundry Co., addressed the combined Pattern and Nonferrous divisions on "Pattern Quality and Maintenance."

Lawrence W. Winnings, foundry engineer, Wagner Malleable Iron Co., spoke to the Malleable division on "Gating and Feeding Malleable Castings." "Shell Molding Equipment" was the topic for the Maintenance and Engineering division, with Jack E. Bolt, technical service engineer, General Electric Co., Pittsfield, Mass., as the speaker.

The chapter's Jan. 6 meeting is designated as "Management and Past President's Night" with Robert L. Reid, director, Executive Program, University of Chicago, speaking on "Problems and Prospects in Executive Development."—*Erle F. Ross.*

St. Louis: The AFS chapter met Nov. 14 at Edmond's Restaurant. Technical speaker was W. L. Adams, district sales manager, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, whose subject, "High-Pressure Molding," generated a vigorous question and answer session. Karl L. Landgrebe Jr., vice president, foundry operations, Wheland Co., Chattanooga, Tenn., and a national AFS director, attended the meeting and gave a short talk relative to national AFS functions and plans.—*H. V. Noemer, Great Lakes Carbon Corp.*

Oregon: On Nov. 13, members of the AFS chapter heard Walter R. Jaeschke, consulting metallurgical engineer, Whiting Corp., Harvey, Ill., discuss water-cooled cupolas. The speaker indicated that foundries are turning to the water-cooled cupola because of severe damage to linings due to corrosion, heat, abrasion, and chemical reactions in the production of low-phosphorus, low-sulfur iron for nodular castings.

Several types of cupolas were described with and without linings, and with various tuyere and stack arrangements. Different cupolas are being used with varying degrees of success, but authoritative examples are lacking because users do not report with accuracy or take all factors into consideration.

Before installing water-cooled cupola melting facilities, foundrymen should be sure that costs are justified by circumstances, melting conditions, and the type of castings to be produced. — *Bill Walkins, Electric Steel Foundry Co.*

Pittsburgh: William Dawson, assistant plant manager, Kelsey-Hayes Co., Detroit, addressed the AFS chapter on Nov. 18. Some 100 members, together with a group of students from Pennsylvania State University, were present for the dinner meeting at the Webster Hall Hotel.

Mr. Dawson, who has had considerable experience in water-cooled cupola practice, spoke on that subject, illustrating his talk with slides showing operations at Kelsey-Hayes. His talk was particularly interesting to members, in view of the small number of water-cooled cupolas in operation.

The speaker said that his experience proved that water-cooled cupolas have many advantages for the foundryman. At first thought to be unsatisfactory, the process proved to be an efficient method of reducing refractory cost. While with Ford Motor Co.'s Dearborn, Mich., iron foundry, Mr. Dawson gained his initial experience in working with a Belgian system for water-cooling the cupola. After extensive tests, adjustments were made to adapt this system to Ford's operations.—*Robert M. Love.*

Saginaw Valley: A double-barreled program was the highlight of the Nov. 7 meeting of the AFS chapter at Fisher's Hotel, Frankenmuth, Mich. About 250 members and guests with ferrous and nonferrous interests heard Ralph A. Clark, manager, foundry service, Electro Metallurgical Co., talk about "The Selection of Cupola Charge Materials," and Carleton C. Hitchcock, president, R. C. Hitchcock & Sons Inc., discuss "Horizons for the Nonferrous Foundry."—*R. J. Gleffe, Central Foundry Division, General Motors Corp., Saginaw Malleable Iron Plant.*

Book Review

Human Understanding in Industry, by William C. Menninger and Harry Levinson, 112 pages, published by Science Research Associates, 57 West Grand Ave., Chicago 10, Ill. Price, single copies, $2.25; group orders, 25 copies or more, $1.75 each; and a Leader's Guide $.50.

Handbook for supervisors presents a practical view of how the human personality functions. It uses factual, understandable material to emphasize its important points. It enables the supervisor to understand himself and his employees better. The material is organized to be suited for supervisor training courses as conducted in some industries. A Leader's Guide, for use in conducting group discussions, also is available.

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BRIKRAM 80 when rammed in place behind rigid forms, forms an excellent refractory lining wherein temperature and resistance to strong flux or slags are desired.

BRIKRAM 80 is used to construct the lower side walls and bottoms of aluminum melting and holding furnaces, center sections of electric furnace roofs and side walls and bottoms of malleable iron furnaces.

BRIKRAM 80, because of its high alumina content, is recommended for use in desulphurizing units where soda ash and other potent fluxes are used. Ladle life can also be increased by using BRIKRAM 80 in the places where the severe wear occurs. In case of ladles holding high temperature stainless steel, or other metals, long service is given by BRIKRAM 80.

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Circle 705 on Page 51

The Shakeout

X-Ray Inspection Cuts Scrap 30 to 40 Per Cent

INSTALLATION OF X-RAY inspection equipment at the Gaines Co. light metals foundry in Rivera, Calif., is reported to have reduced scrap losses 30 to 40 per cent. The x-ray department occupies only 1000 sq ft of plant space and uses a 170KB General Electric Co. unit. It produces a 14 x 17-in. negative which is developed in 15 minutes.

Sample castings are taken off the permanent mold production line for x-ray inspection every 2 hr. Ten per cent of the castings poured are x-rayed, and reports are given to the line foreman within 15 minutes. When defective castings are found, the line is shut down, and two hours of production may be lost. Standby jobs are available, however, so that molders can move to a new part until reasons for the defect have been ascertained. In combination with a hot inspection which is given each casting as it moves along a hook-line conveyor system, x-ray inspection has enabled the company to achieve a reject rate on finished work of less than 5 per cent.

For More Details Circle No. 479—Page 192

Two Tractor Shovels Save $59,000 Annually

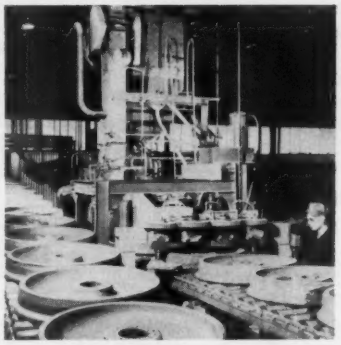
TWO 2¾-yd Michigan tractor shovels are saving an estimated $59,000 annually in open-hearth charging and foundry slag removal operations at Ford Motor Co.'s River Rouge plant, Dearborn, Mich. Between them they annually are moving 418,000 tons of iron ore, limestone, foundry sand, mill scale, dolomite, and spar, plus transporting foundry slag to the refuse dump.

One of these trucks loads a 20-yd truck in six or seven passes (2½ to 3 minutes) and 12-yd trucks in three passes (1½ to 2 minutes). With an interchangeable 5-cu-yd bucket, it can load 20 yd of coal in only three passes. In addition, more efficient use of dump trucks, made possible by the tractor shovels, has reduced size of the truck fleet. The Michigans drive to widely separated jobs at 20 to 25 mph and are ready to work when they arrive at the area involved.

For More Details Circle No. 480—Page 192

Cleans Cast Steel Wheels in One Minute

ONLY ONE MINUTE per wheel is required to remove heat treat scale from cast steel railroad wheels in this Wheelabrator special cabinet, which also peens the surface to an attractive luster at the same time.

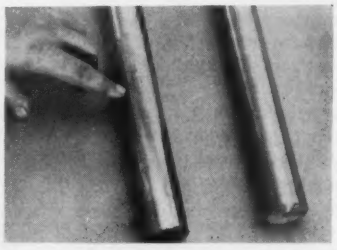


Each wheel casting is cleaned after a two-stage heat treatment and before final inspection. The special cabinet effectively cleans the full production of the plant—a total of 400 wheels a day.

For More Details Circle No. 481—Page 192

Process Cuts Abrasion of Pistons by Sand

SAND ABRASION on pistons in a vertical power pump used to clean sand castings used to be a problem at Elyria Foundry Co., Elyria, Ohio. Although the pump was fitted with dust shields and the water was carefully filtered, fine sand particles caused piston abrasion which resulted in leakage and limited pump life to about 600 hours. The pistons were made of 420 stainless and cost $42.50 each. Although they could be reground twice, pump downtime, labor charges, and new packing costs raised the total cost for the 1800-hr life of each piston to about $105.



In co-operation with Chromalloy Corp., White Plains, N. Y., Elyria Foundry experimented with the use of carbon steel pistons treated by a patented chromium diffusion process known as Chromallizing. This process involves a high-temperature exchange of iron and chromium atoms at the surface of the part and provides it with a chromium carbide layer that is integral with the base metal. Chromallized carbon steel pistons have proved three times more durable than the old ones, but are less expensive. The view above shows a scored old-type piston (left) after 650 hours of use and an unaffected new-type after 1800 of use.

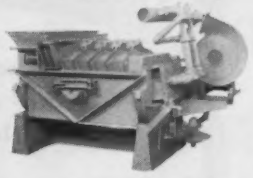
For More Details Circle No. 482—Page 192

For Finer, Faster Castings

STROMAN FURNACES

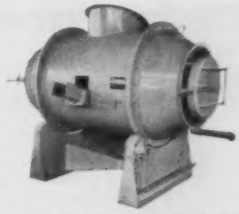
Melting Brass, Bronze, Aluminum, Magnesium or any other non-ferrous metal? Are you Sand Casting, Die Casting, Billet Casting, Permanent Molding, Extruding or Forging? If so, Stroman is your natural source for melting furnaces . . . for Stroman builds only the finest, fastest melting, most economical, longest lasting and of course the most modern furnaces to melt any metal.

Illustrated are just a few of the various models available. A letter will bring Bulletin No. 150 which illustrates the complete line . . . or better yet let a Stroman Metallurgist consult with you on their application in your plant.

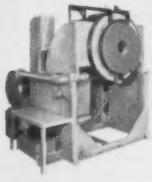


STROMAN "JC" TILTING TYPE FURNACES FOR MELTING BRASS. Fastest Melting . . . from 15 minutes up . . . lowest fuel consumption . . . always perfect metal for castings . . . capacities from 400 pounds to largest requirements.

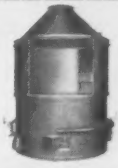
STROMAN REVERBERATORIES for the melting of Unlimited Capacities of Aluminum, Zinc or Brass. Excellent for Smelters or Billet Casters.



STROMAN "RF" BARREL TYPE POWER TILT FURNACE for Brass, Aluminum, Iron and various smelting operations. Sizes range up to 20,000 pounds brass.



STROMAN STATIONARY LIP POUR CRUCIBLE MELTING FURNACES . . . MECHANICALLY OR HYDRAULICALLY TILTED. For brass, bronze, aluminum and other non-ferrous metals. Made in sizes from No. 60 to No. 1000 crucible.



STROMAN IRON POT AND CRUCIBLE STATIONARY DIP-OUT FURNACES FOR MELTING AND HOLDING. For Aluminum, Lead, Zinc and other white metal alloys. Rugged construction with ample combustion room to prevent direct impingement of flame on pot. Available with or without hoods.

STROMAN MANUAL TILT CRUCIBLE MELTING FURNACE. The old standby for melting Brass, Bronze, Aluminum and other alloys with capacities from No. 30 to No. 600 crucible. Real lasting construction and new gear box makes tilting so easy.

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Circle 708 on Page 51

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HARD CHROMED • PORTABLE PNEUMATIC TOOLS

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because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS
because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

IF YOUR PROBLEM INCLUDES
chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

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SALES • SERVICE • STOCK • COAST TO COAST

Circle 709 on Page 51

chemicals for the foundry industry

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ZIRCON FLOUR
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Circle 710 on Page 51

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Frontier 40-E Aluminum Alloy			
Time Aged	Yield Strength	Tensile Strength	Elongation
21 Days	25,440	34,400	5.1
2 Years	31,300	39,300	4.5
2½ Years	30,650	39,050	4.5
3 Years	29,400	37,900	4.0
4½ Years	30,075	38,000	3.75
8 Years	31,550	37,025	5.5

The above figures were derived from 12 sample casts made over a period of 8 years. Figures shown are the average of all the samples in each group.

USE FRONTIER 40-E
The Original Aluminum Alloy

Truck frame cross members like the one illustrated of Frontier 40-E Aluminum Alloy replaced steel members and increased payload 2400 pounds.

Castings made of FRONTIER 40-E actually grow stronger while in use. FRONTIER 40-E is the original Aluminum Alloy containing zinc with magnesium, titanium and chromium. It is backed by twenty-five years of Frontier formulating and metallurgical "know how." 40-E Aluminum Alloy has established a reputation for high strength without heat treating.

Why take chances with alloys that claim to be just as good. Imitations that are too new to have proven their reliability.

Frontier 40-E Aluminum Alloy will keep your customers happy ... and happy customers are the only kind you keep!

Every FRONTIER 40-E ALUMINUM Casting will have These Extra Benefits

- **Shock Resistance** to withstand explosive and standard impact shock.
- **Corrosion Resistance.** Excellent even under stress.
- **High Yield Strength.** Important where distortion or misalignment of parts would make the assembly inoperative.
- **Machinability.** Free machining without tearing of metal.
- **Pressure Tightness.** Fine grain withstands high pressures.

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Exclusive Foreign Producers of 40-E
DARALUM CASTINGS LTD., DARLINGTON, ENGLAND
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L'ALUMINUM FRANCAIS, PARIS, FRANCE

Circle 711 on Page 51

Are You Looking for

- Machineability?
- Chemical inertness?
- High thermal conductivity?
- High temperature stability?
- Resistance to thermal shock?

... then consider GRAPHITE — it has many unique qualities.

We are specialists in graphite specialties. Our technicians will be glad to work with yours.

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GREAT LAKES CARBON CORPORATION
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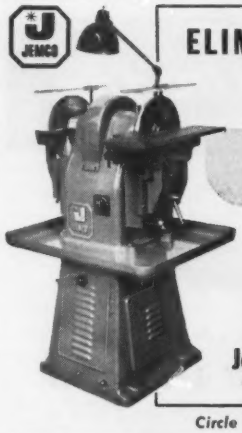
Circle 712 on Page 51

ELIMINATE HAND FILING with the JEMCO Rotary Disc Filing Machine



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Non-Ferrous Metals
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Circle 713 on Page 51

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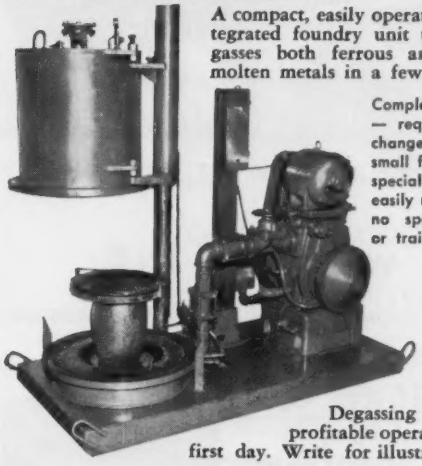
McDONALD CHARCOAL CO.
DWIGHT BLDG. KANSAS CITY 5, MO.
One of the oldest producers in the Midwest

Circle 714 on Page 51

REJECTS and SCRAP due to gas are practically eliminated by . . . Model 400 VACUUM DEGASSING CHAMBER



A compact, easily operated, entirely integrated foundry unit thoroughly degasses both ferrous and non-ferrous molten metals in a few minutes.

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This Vacuum Degassing Unit permits profitable operation from the first day. Write for illustrated bulletin.

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- TIME TESTED
- ECONOMY
- DURABILITY

...SUPER QUALITY REFRACTORY CEMENT

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Use DURA STIX on dry sand molds, as a core wash and as a protective coating on wood bottom boards. Hundreds of other uses!

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Circle 716 on Page 51

TAKE A CLOSE LOOK

At the advantages of

B&A Potassium Titanium Fluoride *for aluminum castings*

- ☐ finer grain structure
- ☐ improved yield
- ☐ higher tensile strength
- ☐ greater elongation
- ☐ better machinability
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The low-cost way of adding titanium: You can incorporate titanium into aluminum alloys *more economically* with Potassium Titanium Fluoride (K_2TiF_6) than with other methods.

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Circle 717 on Page 51

send for this valuable quick-reference 17" x 22" standard alloy wall chart FREE

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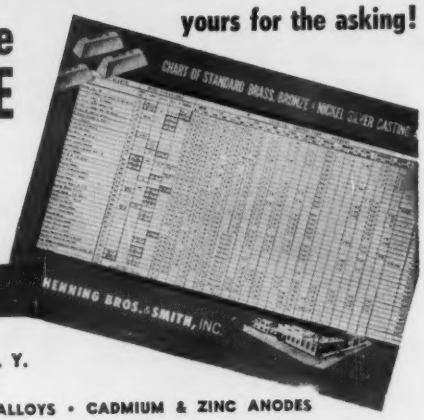

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Circle 718 on Page 51

ALTEX HI-HEAT SHIELD* ENAMELS To protect titanium, zirconium and their alloys against hydrogen-absorption, pitting and scaling; ferrous metals against decarburization during OPEN heat-treatment at temperatures of 1000-1875° F. Easily applied and removable after heating.
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Circle 720 on Page 51

$395
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CUTS MIXING TIME 50% • MINIMIZES AIR HARDENING
NO HEATING • NO CRUSHING • NO BALLING • EASILY CLEANED
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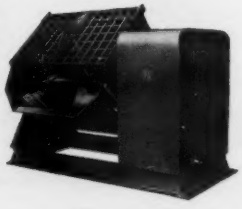

Circle 721 on Page 51

"Put it where you want it, while you watch it!"

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Foundry cranes fall into a class by themselves as we see it.

Abrasive and corrosive atmospheric conditions that prevail in foundries make dirt and dust proof mechanisms imperative. Precision load control with trouble-free operations for long periods of service are requisite.

These and many other valued features are common to Euclid Foundry Cranes.

Push-button and rope pendent floor controls as well as overhead cab operation is available.

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We can build any foundry crane you require.

A phone call or letter will put our services at your disposal.

Write for our Catalog on Cranes and Hoists.

EUCLID
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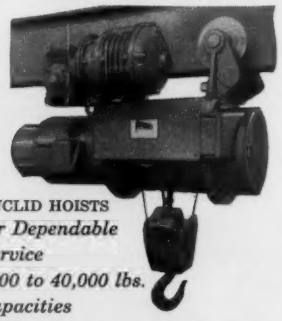

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2000 to 40,000 lbs. Capacities

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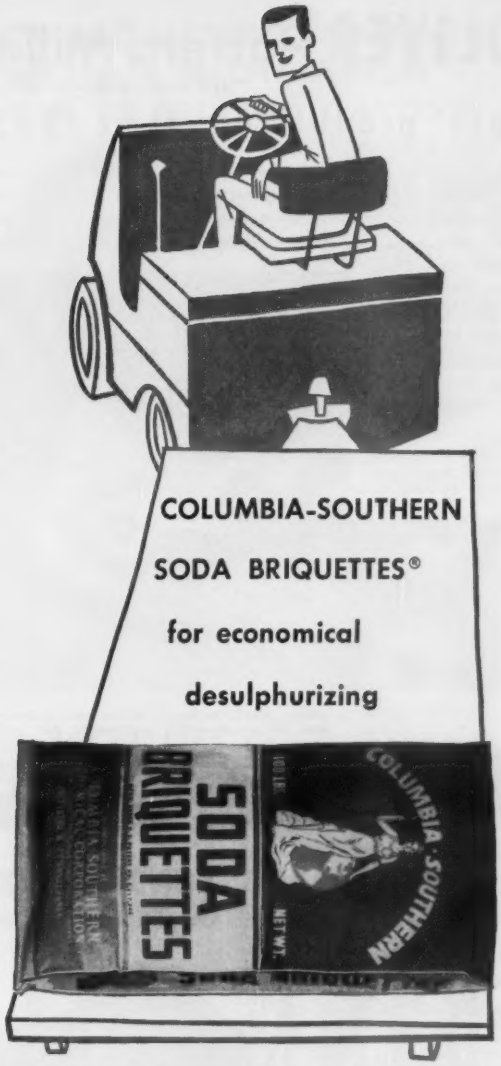

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Circle 723 on Page 51

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affco **AMERICAN FOUNDRY FLASK CO.**
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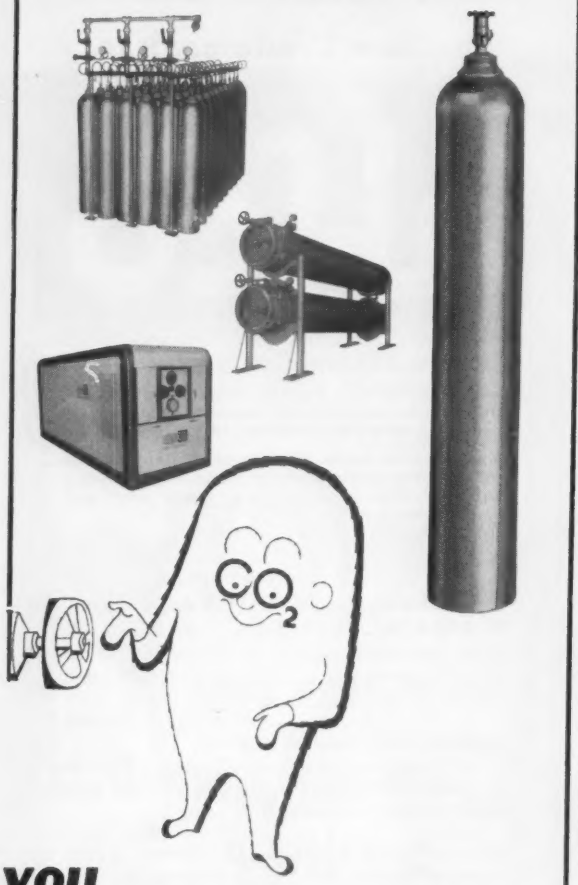
Circle 724 on Page 51

PURECO CO. Supply Systems



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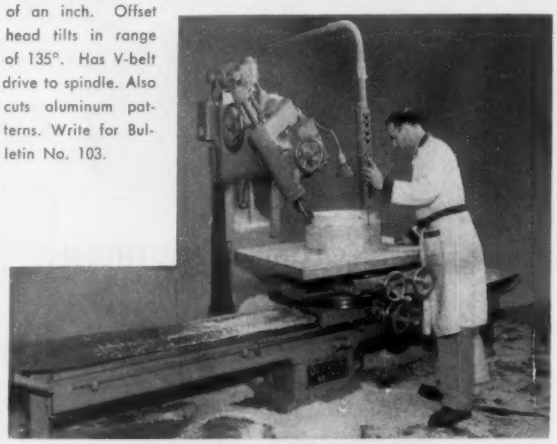

Oliver makes a larger Miller and a complete line of woodworking equipment for pattern shops.

OLIVER SINCE 1890

OLIVER MACHINERY COMPANY
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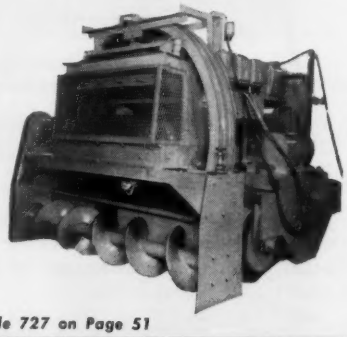

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Circle 728 on Page 51

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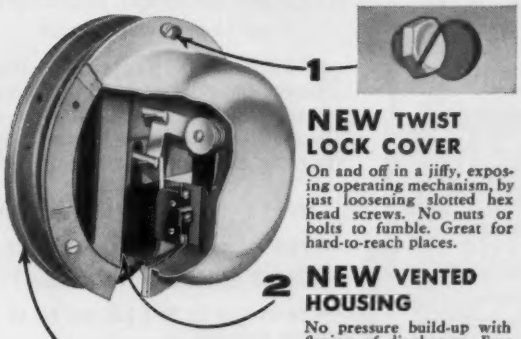
BIN LEVEL INDICATORS



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You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

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Manufacturers of Pneumatic Tools Since 1903

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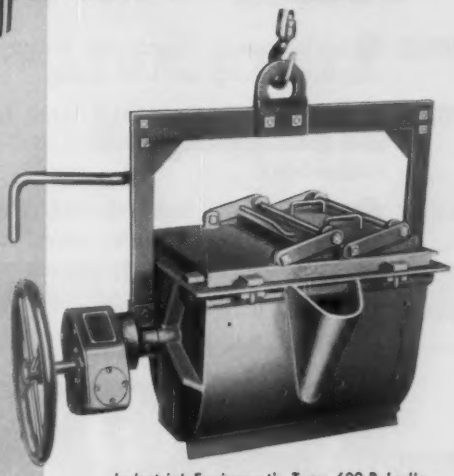
NOW ...to increase Foundry AUTOMATION

Industrial Equipment's Type 600-B LADLE



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Industrial EQUIPMENT COMPANY
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For speed and convenience

MOROC®

the controlled silicate CO_2 binder

A GRADE FOR EVERY FOUNDRY REQUIREMENT

MOROC ❶ High-strength binder for ferrous and nonferrous molds and ladle linings.

MOROC ❷ For medium-sized and large molds and cores. Has high-strength and good collapsibility.

MOROC ❸ High-strength, high-collapsibility binder for ferrous and nonferrous cores, can be used in core blowing equipment.

MOROC ❹ Binder with extra-high collapsibility, especially well-suited for core blowing equipment.

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MOROC CORE PASTE—For joining sections of silicate bonded cores. Fast drying, gives a high-strength bond in minimum time. Supplied in 55-gal. drums, 5-gal. pails.

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Circle 734 on Page 51

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639 pages, 400 illustrations, 123 tables

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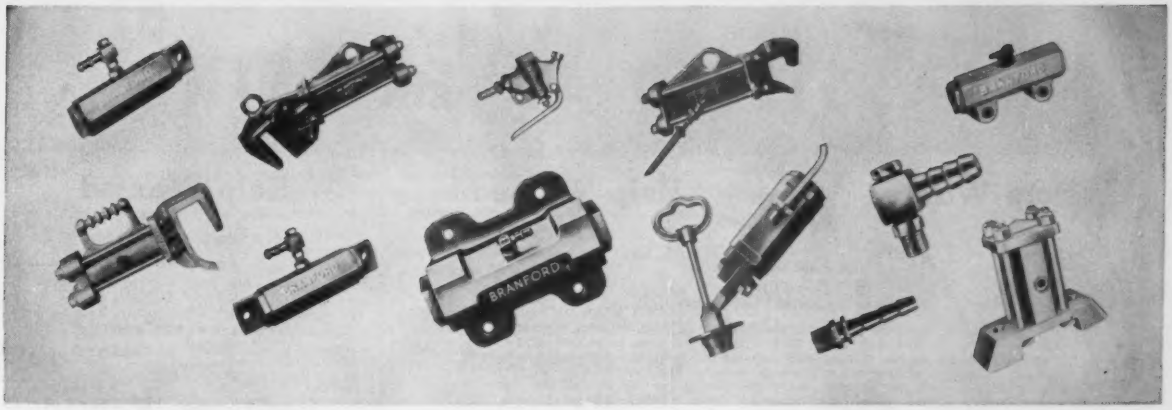

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CORE WORK, SAND FACINGS, SPRAYS

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A long established nationally known firm of Foundry Engineers wants Associate Engineers who are thoroughly experienced in the Foundry Industry—Work Measurement—Costs—Systems—Layout. Address: Box 802, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT TO FOUNDRY SUPERINTENDENT

A Wisconsin production gray iron foundry, producing quality automotive and agricultural castings, requires an assistant to the foundry superintendent. A broad knowledge of modern foundry processes and previous supervisory experience necessary. The position offers opportunities for further advancement. Attractice salary with better than average benefits.
Please list complete background in first letter including references and salary desired.

BOX 838, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

CLEANING ROOM SUPERINTENDENT

Must have supervisory experience and be completely familiar with all phases of cleaning room operation for a miscellaneous steel jobbing foundry producing castings up to 10,000 pounds. Excellent opportunity for an aggressive qualified man with a modern and progressive foundry located in the Middle West producing 600-700 tons per month. Advise full particulars including salary requirements. Address: Box 824, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Wanted—Man to take over complete charge of sand foundry operations of large foundry in Milwaukee area. Must have previous experience in supervising either steel or nonferrous casting production including melting, molding and coremaking. Prefer man in 40 to 50 year bracket who is thoroughly familiar with the production of large castings up to 20,000 pounds. Salary open. Please reply stating your personal data, qualifications, experience, salary expected and availability in first letter. All inquiries will be held in strict confidence. Direct all correspondence to: AMPCO METAL, INC., PERSONNEL DEPARTMENT, 1745 SOUTH 38 STREET, MILWAUKEE 46, WISCONSIN.

CHIEF INSPECTOR

For Eastern Steel Foundry producing a wide range of carbon and alloy steels. Should have experience with all types of castings, including pressure castings. Must be experienced in handling men. Address: Box 827, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

NONFERROUS FOUNDRY FOREMAN

Medium size sand aluminum foundry near Cleveland, specializing in medium and large jobbing work. Must know all phases of foundry operations and aluminum alloys. In reply, give age, experience, references and include a photograph. Address: Box 828, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

FOUNDRY SUPERVISOR

Experienced, to direct high production mechanized iron molding operation in St. Louis. Excellent future.

BOX 841, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

Positions Wanted

MANAGEMENT OR SALES

General manager of gray iron foundry for last six years, responsible for all plant operations and sales. Metallurgist with experience in malleable and gray iron, technical, operational, plant development and sales phases for ten years previous to present position. Seeks responsible management or sales position with progressive organization. Address: Box 837, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

YOUNG METALLURGICAL TRAINEE

With eight months' training, age 19, wants to acquire thorough practical experience in steel melting, open hearth and/or electric steel mill or steel foundry. Seriously interested in steel making. Strong and healthy. Compensation secondary. Location anywhere. American. Military status—Reserve. Address: Box 804, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

General Foundry Foreman now operating a captive high alloy steel, carbon steel, gray iron and nonferrous foundry for large mining company. Graduate Metallurgist; age 38, familiar with cupola, electric furnace, acid and basic processes, sand slinger, floor molding, squeezer work, jobbing and production experience. Available March 1st, 1958. Address: Box 836, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

A-1 foundryman, 30 years' practical experience, ferrous and nonferrous, jobbing and production. Fully qualified to take complete charge of all foundry operations, mix metals by analysis, iron, semi-steel, ductile iron, brass, bronze, copper, aluminum in green sand, dry sand, semi-shell and shell molding. Capable of handling pattern shop. Address: Box 846, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Engineering graduate. Well versed in all phases of ferrous high production foundry operations. Seventeen years of practical experience in engineering, quality trouble shooting, operating, and management. Now employed. Consider employment anywhere. Address: Box 805. FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER

Degree, Metallurgy, 25 years experience in all phases of ferrous and nonferrous operations—administrative, cost analyses and liaison for multi-plant operations. Considerable experience in plant layout and design. Will relocate and consider foreign assignment. Age 46. Minimum base salary $12,000. Address: Box 794, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY MANAGER

Thirty-two years' experience covering gray cast iron, malleable cast iron, pearlitic malleable cast iron and cast steel. Experience in automotive, agricultural, stove plate and enamelware castings. Work background, manager, foundry consultant, sales engineer, operating foreman and metallurgist. Aggressive. Salary open. Address: Box 833, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD DESIGNER

Wish part time work, design, layout, detail estimating. Address: Box 840, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD DESIGNER

Aluminum, 25 years experience, capable of heading entire operation. Address: Box 839 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS
Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact
DRAKE PERSONNEL, INC. **HARRISON 7-8600**
JOHN COPE, DIRECTOR **220 SOUTH STATE ST., CHICAGO, ILL.**

SALARIED PERSONNEL
$5000-$30,000. This reliable service established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring if employed full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, P.O. BOX 674, MANCHESTER, VERMONT.

Positions Wanted

FOUNDRY MANAGER FOR MECHANIZED GRAY IRON PRODUCTION
Want position with full responsibilities for profitable operation. Complete charge of all departments including SALES, QUALITY, PRODUCTION, SERVICE and COST ACCOUNTING. Full experienced in all phases of Foundry Management and Operations. Salary $20,000 per annum. Address: Box 829, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY FOREMAN OR ASSISTANT SUPERINTENDENT
Age 48, thorough knowledge of all phases of gray iron foundry operations, including cupola; 27 years' gray iron foundry experience. Eighteen years' foundry supervision. References furnished. Address: Box 806, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WORKS MANAGER
Gray iron foundry service engineer, 36 years old, seeking a stationary position. Presently employed with a well-known foundry consulting firm. Familiar with all phases of operations including all of the newer foundry developments, metals and processes. Will consider investing money, if desirable. Address: Box 834, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER—SUPERINTENDENT
Well-known ferrous—nonferrous foundryman and consulting authority on foundry practice desires a good permanent association with a progressive firm. Address: Box 843, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

ASSISTANT SUPERINTENDENT
Young foundryman with sixteen years of sound technical and practical background of all phases of gray iron foundry. Interested in responsible position with opportunity. Employed. Address: Box 831, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT-SUPERVISOR
Thoroughly versed in all phases of operations in gray, semi-steel, Meehanite and alloyed irons. Excellent handler of men. Have the ability and know-how to produce results. 26 years' experience. Address: Box 823, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN
37 years of age, ten years experience as supervisor in iron and steel jobbing foundries. Best of references. Address: Box 830, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry Consultants

CONSULTING ENGINEER
Thirty-five years' Experience
Acid and Basic Practice
Improved methods in electric furnace melting. Low cost with high productivity. Avoid expensive mistakes. Acquire consultation prior to the purchasing of your new furnace and in planning, modernizing, and organizing of your melt shop. **EUGENE H. WEAK 2933 HIGHWAY AVE. HIGHLAND, IND. PHONE: TEMPLE 8-1244**

FOUNDRY CONSULTANT-NONFERROUS
Sand — permanent mold — centrifugal permanent mold — and centrifuge permanent mold. High pressure castings a specialty. Address: ED JENKINS, RT. #3, BOX 345, WALKERTON, INDIANA, PHONE: 712W.

Representatives Available

SALES AND SERVICE REPRESENTATIVE
Desire position selling and servicing foundry supplies, binders, shot and grit, etc. B. A. degree, six years' foundry experience; 1½ years sales experience, good references; resume upon request. Will consider foreign assignment, presently residing in New England. Address: Box 835, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANUFACTURER'S REPRESENTATIVE
Now calling on foundries in Ohio, Michigan and Indiana seeking an additional product or products. Address: Box 845, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representatives Wanted

WANTED
Sand Sales Representatives to sell Tennessee Hi-Fusion Natural Bonded Molding Sands to foundries. Old company, good commission arrangement, reliable production. Property and plant in heart of Tennessee foundry sand area.

BOX 832, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

REPRESENTATIVES WANTED
NORTH AMERICAN FOUNDRY EQUIPMENT COMPANY, WITH OFFICES IN CANADA, IMPORTING COMPLETE RANGE OF MOST MODERN BRITISH FOUNDRY MACHINERY WISHES TO CONTACT ESTABLISHED COMPANIES IN UNITED STATES HAVING LIVE CONNECTIONS WITH FOUNDRIES THROUGHOUT U.S.A. TO ACT AS STOCKISTS AND SELLING AGENTS. ADDRESS: BOX 810, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

REPRESENTATIVE WANTED
Large Eastern, well established magnesium and nonferrous foundry with high regard in aircraft industry, would like to engage Sales Representative on commission basis. Address: Box 826, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE
THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquires from any country regarding this method and process.

CHARLIE AMMEN'S FOUNDERS CORRESPONDENCE SCHOOL OFFERS
A simple complete course in founding stressing the small details, practices and variables involved in the basic operations necessary to the production of quality castings. Address: Box 842, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SCRAP AND COST HIGH?
Reduce cost, increase quality and quantity, reduce scrap, by a simple effective service performed in your plant. For details address: CHARLIE AMMEN, 1029 PHILIP ST., NEW ORLEANS, LA.

HAVE YOU EVER NOTICED

the many types of headings under which classified ads are listed? There's one for every want—if you want to obtain qualified personnel, want to sell used machinery, want to buy equipment, or want a better position, you should advertise in the classified section of FOUNDRY.

FOUNDRY has 75,000 readers. They represent a readership which covers the entire foundry industry. What does this mean to a classified advertiser? It means that for a nominal sum you get the widest possible coverage of the industry. Your message reaches "just the right people".

classified
advertising dept.
Foundry ★
Cleveland 13, O.

Wanted-To-Buy

WANTED TO BUY

High Frequency Induction Melting Equipment. 100-250 K.W. State price, condition, availability, location, detailed description of equipment and accessories. Address: THE PERMANENT MAGNET CO., INC., INDIANAPOLIS 26, (LAWRENCE) INDIANA.

WANTED

Osborn Roto-Lift Molding Machine, Model 3161. Address: Box 795, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXER WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry For Sale

FOR SALE, LEASE, OR JOINT VENTURE

Going nonferrous, specialty foundry and polishing shop. Two oil furnaces. Established eighteen years, brick building. Address: HODGE & SHERMAN, AGENCY, 304 FIRST NATIONAL BANK BUILDING, ELKHART, INDIANA.

For Sale

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter-Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2, 24" x 16", 100# pressure with 300 HP motor.
3—Link Belt Roto-Louver Rotary Dryers, Models: 207-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

FOR SALE

Muller, No. 3½ Mulbaro with two barrows. Address: GILBERT BRASS FOUNDRY CO., 5036 FARLIN AVE., ST. LOUIS, MISSOURI.

For Sale

FOR SALE

1—Wheelabrator 36 x 42, serial A19275 with loader
1—Wheelabrator 27 x 36, Serial A65858 with loader
1—Foundromatic Shake-Out 48 x 72, rebuilt Feb. 1957.
1—Carbon and Sulphur Determinator, Leco 2600 complete
1—Sklenar Furnace, Tilting, 600# capacity.

NEW ENGLAND MALLEABLE IRON CO.
3 IDAHO AVENUE
LINCOLN PARK 7, RHODE ISLAND
TEL. NO. REgent 7-7502

FOR SALE—PIG MACHINE

Conveyor type motorized pig machine. Pour 25-40# steel pigs. Details on request.

CRUCIBLE STEEL CASTING COMPANY
2850 SOUTH 20TH STREET
MILWAUKEE 15, WISCONSIN

FOR SALE

75 Steel core trays, 24 inches long, 12 inches wide by 6 inches deep, 16 gauge bottom, 11 gauge ends, open sides. Never used.

WOOSTER BRASS DIVISION
The Fyr-Fyter Company
Wooster, Ohio

FOR SALE

Patterns and core boxes for small soil piping, and fittings. Address: ALTON BRASS & CASTING CO., 705 PARK DRIVE, ALTON, ILLINOIS, PHONE 5-5132.

MOLDING MACHINE

Herman 6000# capacity, jolt-roll-draw in operating condition. Asking $2900 f.o.b. Address: POTTSTOWN MACHINE CO., POTTSTOWN, PA. (Phone 37, H. H. Houston)

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

$10,000 stock of new Pangborn replacement parts for 6 & 9 LG-14 Table Blast priced 25% less list. Send us list of parts wanted.

9′ LG-14 Pangborn Table	$4500.00
6′ LG-14 Pangborn Table, like new	3000.00
6′ LE Pangborn Air Table	800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tumblast	5000.00
42 x 48 Wheelabrator Tumblast	1500.00
36 x 42 Wheelabrator Tumblast	2000.00
27 x 36 Wheelabrator Tumblast	2750.00
15″ Continuous Wheelabrator Tumblast	1000.00
5′ Wheelabrator Table Blast	2000.00
6′ Wheelabrator Table Blast	3000.00
4′ Wheelabrator Table Blast	2500.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-36750

We will Buy one piece or your entire plant; or represent you at any auction at a savings to you.

FOR SALE
MAKE US AN OFFER

2—only Continuous flow American Wheelabrator Tumblast machines. These machines have never been used and can be purchased for a fraction of their original cost.
2—Used Sandblast cabinets with dust collectors.
2—Used Vacu-Blast machines.
1—30" diameter Pangborn Roto-Blast with dust collector.

This equipment all in excellent condition.

PACIFIC MARINE SERVICE
BLDG. 10, SWAN ISLAND
PORTLAND 18, OREGON
PHONE BU. 9-5749

ELECTRIC

Melting Furnaces
LARGEST STOCK IN THE COUNTRY

ELECTRIC MELTING FURNACES—3 PHASE

SWINDELL 9′ Dia. Top Charge cap. 3 ton steel 5 ton iron per hour, 3500 KVA 13800 volt transformer, complete in place.
2—"LECTROMELT" 2 TON Size Q 4000# per hour 1500 KVA 13200 volt.
1—"LECTROMELT" Size S 1000# per hour, 500 KVA 7200 volt.
1—"LECTROMELT V" 2-300# capacity per hour 220 volt primary.
LECTROMELT 500#, Size T, 300-375 KVA, 2300V primary, Moore controls, G.E. circuit breaker.

ELECTRIC MELTING FURNACES—SINGLE PHASE

1—DETROIT Rocking Type "LFY" 700# cold charge 7200 volts
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V.
2—DETROIT "LFC" 350# Tapered shell 7200 V.
1—DETROIT "LFA" 350# shell 13200 V.

NONFERROUS FURNACES

1—HEVI-DUTY HD-181-S Pot type Electric

HEAT TREATING FURNACES

HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
DESPATCH DT36 Pit type 42″ x 40″ Electric

FURNACE TRANSFORMERS

1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

ACME

ACME EQUIPMENT CO., INC.
We will buy for cash a single piece of equipment or your entire plant
126 South Clinton Street • Phone: ANdover 3-3430 • Chicago 6, Illinois

MONA

For Sale

POWER EQUIPMENT CO.
OFFERS
BARGAIN PRICES
ON GUARANTEED
NEVER USED AND REBUILT
MOTORS!

JANUARY SPECIALS
REBUILT MOTORS

HP	Make	Type	Speed
200	L.A. T.E.F.C.B.B.	JX-137	1200
150	G.E. T.E.F.C.B.B.	K-6328	3600
100	Al.Chal. T.E.F.C.B.B.	ARZ-505	1800

Send for our FREE Catalog

Cash for your surplus new & used electric equipment
Send your list today.

Large line of motors, control equipment, AC & DC Generators, MG sets and transformers.

POWER EQUIPMENT CO.
8 Cairn St., Rochester 2, N. Y.
Phone GEnesee 8-5629

FOR SALE

FLASKS
ALUMINUM FLASKS
SNAP—SLIP—POP
FROM 10" x 10" to 48" x 48"
JACKETS—IRON—ALUMINUM
STEEL FLASKS
FROM 10" x 10" to 10' x 16'

THE HOMAN MACHINERY COMPANY
710 E. FRONT ST., CINCINNATI 2, OHIO
MAin 1-0339

FOR SALE

#3 Whiting Coal Pulverizer—serial #681
1 Reliance motor, 220-440 Volt ½ H.P. 1750 R.P.M. 60 cy.
1 Century motor, 220-440 Volt 7½ H.P. 1750 R.P.M. 60 cy.
1 Westinghouse motor, 220-440 Volt 3 H.P. 1165 R.P.M. 60 cy.
Together with tilting mechanism & trunnions for 5 ton Holding furnace. Good condition. Reasonable.

STILLMAN FOUNDRY COMPANY
1927 WILL AVENUE, N.W.
GRAND RAPIDS 4, MICHIGAN

CHARLIE AMMEN'S NONFERROUS RECIPES
A collection of Patinas, washes, binders, sand, core, metal mixes and assorted dope. $7.00. Address: C. W. AMMEN, 1029 PHILIP ST., NEW ORLEANS, LA.

For Sale

FOR SALE

1—3 ton Heroult Electric Arc Furnace, less transformer and panel board. Condition excellent. Will sell cheap.
2—Tea Pot Spout receiving and pouring ladles, air cooled trunnion, worm gear, 6920 capacity for steel, never used.
Several large size Hines aluminum flasks, all in excellent condition.

MEMPHIS CASTING WORKS, INC.
1006 OAKLAND AVENUE
MEMPHIS 1, TENNESSEE

FOR SALE
MOTORS—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P.O. Box 51—Rochester 1, New York

FOR SALE

WORTHINGTON AIR COMPRESSOR—
6 x 7; 15 HP; Ser. #L 51311.....$1,250.00
GARDNER HORIZ. DISC GRINDER—
54"; 20 HP..... 650.00
#40 Beardsley & Piper Speedmuller
Rotoclone Dust Collector—#10 Type W
MOLDING MACHINES, CORE BLOWERS, FURNACES, CORE OVENS, etc.
FOR THE BEST DEAL CALL
BALCHER MACHINERY COMPANY
695 E. 152nd STREET
CLEVELAND 10, OHIO
TELEPHONE: GLenville 1-2474

FOR SALE

Complete Palmer-Bee conveyor system. Has one 180° turn with variable-speed drive unit, one 180° turn with take-up unit, two 180° turns with idlers, six 90° turns with idlers, 450' of track, chain and 95 carriers, each suitable for holding two 15" x 20" shell molds. Equipment has had little use and is in excellent condition. Priced reasonably. ADDRESS: CARLSON PATTERN SHOP, INC., 616 BERKSHIRE AVE., SPRINGFIELD 9, MASSACHUSETTS.

FOR SALE

2 Used Model "L" Beardsley & Piper Screenarators both in very good condition. 3 phase, 60 cycle, 220 volt, motors. One is six years old, price $500.00. One is one year old, price $1500.00. Prices f.o.b. Little Falls, New Jersey. Address: NORTH JERSEY FOUNDRY CO. INC., 453 MAIN STREET, LITTLE FALLS, NEW JERSEY.

FOR SALE

2—Lindberg Radiant Fired Electric Furnaces complete with controls, 440 V, 50 KW. Address. ALUMINUM MATCH PLATE CORP., 1500 MILITARY RD., BUFFALO 17, NEW YORK.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

For Sale

FOR SALE

CLEARFIELD Muller 230C-60"
OSBORN 212J, Jolt Squeezer
REDA 400# Aluminum Furnace
DAVENPORT 3248 AJS
SPO 110J Squeezer
MAGNET, 36"
TABOR, jar rollover, power draw, table 22x42, 600 lb. cap.
OSBORN, jolt rollover, table 30x40
INT., rollover, 30x8, portable
INT., rollover, 24x10, portable
INT., rollover, 30x8, portable, no jolt
DAVENPORT, #28SA, jolt rollover
J & J, rollover 24x30
10—OSBORN 275J, Squeezers, portable
2—OSBORN 275J, Squeezers, Stationary
2—CHAMPION Model JS-10S Jolt Squeezers
2—MILWAUKEE Squeezers, Stationary
2—INTERNATIONAL Squeezers, Portable
6—ARCADE Model 100S Jolt Squeezers, Stat.
HERMAN Jolt Stripper, 48x54
INTERNATIONAL Plain Jolt, 36x45 Table
NICHOLS Plain Molding Machine, High Speed
SPO Model 506 SP-2, Jolt rollover, Pattern Draw, Pin Lift, 22x26 table
3—INT. TYPE R, Core Maker Rollovers, Hand
INTERNATIONAL Core Blower SB 13
INTERNATIONAL Core Blower SB 11
CHAMPION Core Blower CB 18
PORBECK Core Oven Drawer Type
2—COLEMAN Core Ovens Drawer Type
CLIMAX Wire Straighteners No. 2
ROYER Screenerators
SIMPLICITY Screenerators
SAND MIXERS, paddle type
GRINDERS, 1 hp. to 25 hp.
DISC GRINDERS
POURING DEVICES & DISTRIBUTORS
LADLES ALL TYPES 50 lb. to 5000 lb.
GYRATORY RIDDLES, 20" to 24"
MONORAIL & BRIDGES
AIR HOISTS, 500 lb. to 4000 lb.
OVERHEAD CHAIN CONVEYOR, #458 and DRIVES
BLOWERS ALL SIZES, CENTRIFUGAL & POSITIVE
DUST COLLECTORS, ALL SIZES
TRANSITE CORE PLATES, ALL SIZES
FLASKS—THOUSANDS IN STOCK—ALL SIZES STEEL—ALUMINUM—JACKETS
MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE
THE HOMAN MACHINERY COMPANY
710 E. FRONT ST.
CINCINNATI, OHIO
MAin 1-0339

SURPLUS EQUIPMENT

Connersville blower with 30 HP induction motor, Foxboro control, Arcade molding machines, portable, squeeze, Whiting screen type dust collector. Howe platform scale. Address: P.O. BOX 54, STATION E, ATLANTA, GEORGIA.

FOR SALE

House Trailer, Flamingo, 1956, Prime Conditions, 48' x 8' at Weaverville, California. Subject to prior sale. Address: Box 844, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — **CLEVELAND 10, OHIO**

OSBORN ROLLOVERS:
4—405, 18" draw, air clamps, 3500# cap.

WHEELABRATORS
1—20" x 27" 2 cu. ft. Tumblast
1—27" x 36", 5 cu. ft. Tumblast, w/loader
1—36" x 42", 11½ cu. ft. Tumblast, w/loader
1—36" x 42" air blast Wheelabrator
1—18 cu. ft. Pangborn Rotoblast Master w/loader

MULLERS
1—610 Clearfield 14 cu ft. capacity
1—#1 Simpson, 4 cu. ft. cap.
1—#2 Simpson, 14 cu. ft. cap.
1—#3 Simpson, 30 cu. ft. cap.

SWING GRINDERS
1—7½ H. P. Mummert-Dixon
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACES:
1—80 lbs. Detroit Rocking
1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

Circle 877 on Page 51

THE ACME BARGAIN PAGE

AIR COMPRESSORS
2—INGERSOLL RAND 450 cfm., 100 hp., 220-440 V.
1—CHICAGO PNEUMATIC 225 cfm., 50 hp., 220-440 V.

BELTING
30" x 280' 24" x 263'
29" x 180' 24" x 152'
24" x 120'

BLOWERS
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
WHITING-ALLIS CHALMERS 5750 cfm., 28 oz., 60 hp., 440 V.
WHITING-SPENCER 5600 cfm., 32 oz., 75 hp., 220-440 V.
INGERSOLL-RAND 4000 cfm., 60 oz., 100/25 hp., 220-440 V.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 2850 cfm., 16 oz., 20 hp., 220-440 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

BUCKET LOADER
NATIONAL #3 Skip bucket loader 3400# cap. 6 probs and Wheelco Instrument to average temperature

CONVERTERS—MOTOR GENERATORS
1—100KW WESTINGHOUSE 250 V. DC. 400 AMP. 220 V. Crocker Wheeler controller and panel.
1—15KW HERTNER Motor Generator Set, 25 hp., 3/60/220-440 V. primary, 250 V. 60 amp DC.

CONVEYOR OVERHEAD CHAIN
1700' JERVIS B WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, & motor generator set, takeups and turns.

CONVEYOR
36" x 162' LINK BELT Oscillating Pan 10 hp., 220-440 V.
36" x 53' LINK BELT Oscillating pan.
17' BARBER GREEN Bucket Conveyor.
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
18" x 10' Steel Apron Conveyor w/drives, 3 hp., 220-440 V.
16" x 120' Rubber Belt w/drives.

CORE BLOWERS
CHAMPION CB400 up to 300# cores, 6½" draw.
C.B. 15 up to 55# cores.
C.B. 10 up to 12# cores, 4½" draw.
DEMMLER #4 up to 250# cores.
DEMMLER #3 up to 35# cores.
DEMMLER #2 up to 20# cores.
INTERNATIONAL SB15H, up to 150# cores, Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores
REDFORD Bench types, horizontal or vertical clamping

CORE DRAW
SPO CD 36 14" x 41" rollout table.

CORE GRINDER
6—MILWAUKEE 70-9, 70" dia. table
1—OWOSSO DE1-303 42" table

CORE OVENS INDUCTION
THERMONIC 1800A cap 2000# hour

CORE OVENS TOWER
COLEMAN Vertical-Horizontal 9000# per hour
COLEMAN Vertical-Horizontal 6800# per hour

CORE PASTE OVENS
COLEMAN 28' Horizontal

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw

CRANES
P&H 5 TON Electric Traveling DC motors 50' span
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 Ton AMERICAN Railmaster Low headroom floor control
10 Ton SHAW BOX electric hoist

CRUSHER—PULVERIZER
STEDMAN 12" x 12" 4/10 hp 3/60/220-440 V motor

CUPOLA GUNS
BONDACTOR #1250
BONDACTOR #1000

DUST COLLECTOR
PARSONS 40,000 cfm. cloth bag type

FEEDERS
3—SYNTRON Vibra Flow Feeders F4100, w/controllers

FLASK SECTIONS STEEL
42—27½" x 48" x 8½" high
26—39½" x 53½" x 9" high

FURNACES NONFERROUS
STROMAN 1000# Oil fired, hydraulic tilt.
CAMPBELL HAUSFELD Staty. pot type
FISHER RB100 gas fired crucible

GRINDERS, SNAG
2—HAMMOND 20" DE 10WR1 10 hp., 220-440 V.
1—HAMMOND 20" DE Porter Cable backstands 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
1—US #65 D. End 30" x 3" x 12" 20 hp., 4 speed, 440 V.

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
U.S. 20" x 2½" x 6" 10 hp., 220-440 V.

GRINDERS, MISC.
PORTER CABLE BG8 Wet-Dry Belt
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel

HOISTS
YALE 5 TON floor control power travel
SHAW BOX 5 TON floor control Hand travel
4—INGERSOLL-RAND Air trolleys
4—CLEVELAND 2000# Cab type hot metal carriers

LADLES
1—6000# Industrial Enclosed Geared Crane
1—5000# Modern Enclosed Geared Crane
3—2125# Industrial Enclosed Geared Crane
1—2000# Whiting Enclosed Geared Crane

LADLE MIXING
4000# Industrial, Insulated

LADLE HEATERS
2—NORTH AMERICAN Flexible hose.

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
2—MILWAUKEE 125-3-21" x 27" Table 8" draw.
7—OSBORN 712 PJ, 18" x 21" Table
1—CHAMPION JSL10P 18" x 21" table 6" draw.

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16" x 20" table
1—SPO, 110J Portable 17" x 20" table
4—CHAMPION, JS10P 18" x 21" table

JOLT ROLLOVER DRAWS
4000# HERMAN, 36" x 60" table
3000# HERMAN, 52" x 84" table
1500# HERMAN, 26" x 48" table
3—1000# TABOR, 30" x 51" table, portable
3—#22 DAVENPORT
1020 JOHNSTON & JENNINGS, 60" x 50" table
2—750# HERMAN 20" x 30" table
20 x 8" INTERNATIONAL type G, 20" x 30" table
2—INTERNATIONAL RJ 20 x 12"
2—INTERNATIONAL RJ 14 x 8"

JOLT PIN LIFTS
3—INTERNATIONAL 1200-3 26" x 27" table 3" draw
1—INTERNATIONAL 26" x 30" table, 8" draw

JOLT SQUEEZE FRAME STRIP
#814 OSBORN 14" x 30" Pattern space.

PIN LIFT PUSHOFF
CHAMPION 28" x 42" table
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
1—#3 SIMPSON Unit Drive, w/cooling
2—#1 SIMPSON Mullers
1—24" SIMPSON Laboratory muller
1—WONDER "HOE BOY" 3-4 cu. ft.

POLISHING MACHINES
MARSCHKE 6 Station Roto-Mat 5-heads.

RIDDLES
2—B&P CHAMPION 200# per min.
1—UNIVERSAL 20"

SAND CUTTERS
2—SCREENARATORS Model "8"
1—ROYER MCZ-43

SAND SLINGERS
2—B&P Tractor 19" heads

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
32" CRESCENT, 2 hp., 440 V.
30" TANNEWITZ, 3 hp., 440 V.
42" TANNEWITZ, 5 hp., 220-440 V.
6" x 6" RACINE Oil Cut Hack Saw

SAWS, CUTOFF
DEWALT ME-1 16" Blade 5 hp.
DEWALT ME-3 Abrasive cutoff 18" wheel
DEWALT GP 14" wheel 3 hp. 220-440 V.
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SCREENS
3' x 8' SIMPLICITY

SHAKEOUTS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
5' x 10' LINK BELT

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
TINIUS OLSON Hardness Tester
COLEMAN 55 Spectrophotometer
BALDWIN SOUTHWARK 20,000 Tensile Tester w/load indicator and recorder

TUMBLING BARRELS
3—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY 42" x 42" x 64" 10 hp.
SLY 42" x 42" x 56" 5 hp.
SLY 36" x 72" 7½ hp.

WHEELABRATORS
2—42" x 48" AMERICAN Skip Loader
1—27" x 36" AMERICAN Skip Loader
1—20" x 27" AMERICAN Rubber Belt

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc.
OLIVER 72DR Router or borer
PORTER 24" Facing Planer
BOICE CRANE 12" Planer
SYRACUSE 15" Disc Sander
STATE Oscillating Spindle Sander
HESTON ANDERSON Swing Saw #5
DELTA 10" UNISAW
OLIVER Patternmakers Vises
NORTHFIELD #4 Tilting Arbor Saw
OLIVER 20A Pattern Lathe 16"
PUTNAM Pattern Lathe 24" x 12'

WIRE STRAIGHTENERS
2—#2A CLIMAX Wire Straighteners

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WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR COMPRESSORS
1—SULLIVAN angle compound, 600 CFM.

AIR & ELECTRIC HOISTS
15—DETROIT Air Hoists, 1, 1½, 5 ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.
85—INGERSOLL RAND Air Motor Type. Sizes RC-5, A, B, C, D-6, ¼, ½, 1 and 3 ton capacity.
4—KELLER 1 ton capacity air hoists.
1—SHAW BOX 2 ton load lifter.
2—YALE ½ ton.

BUCKET ELEVATORS
12—LINK BELT & JEFFREY, 30, 40, 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7 buckets.

CUT-OFF MACHINES
2—AMERICAN H-Rod Straighteners.
1—DeWALT ME 2, 10 HP, 24" Blade.
1—GROB Band Saw, Type OS-36.
TABOR C10AF—18" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS
3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model Nos. 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4, & 4E. From 10 to 100 lb. Cores.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb to 75 lb. cores.
3—MILWAUKEE #3A Bench Type.
1—SPO Model SC-10-DM Shell Core Blower.
1—SAN-BLOW, Model CB-40-B, 40# Cores.

CORE OVENS
4—CARL MAYER 2-Compartment, oil fired, I. D. 7' W x 14' deep x 8' H each.
1—INDUSTRIAL "Revolving Carriers" continuous, 15" x 30" trays.
2—PORBECK Model C-3-C, Double Drawer Type. Gas fired, new in 1955.

CUPOLA BLOWERS & EQUIP.
1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP, 3500 to 10,500 CFM w/blast gates.
1—ROOTS 7,000 CFM, 50 HP motor.
14—LINDBERGS. From 1 HP to 15 HP, 160 to 2100 CFM.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1250-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE
9—AMERICAN AIR FILTER Type N&W, Sizes No. 10, 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES
1—AJAX 20 KW Induction Unit.
1—TOCCO 20 KW Induction Unit.
3—AJAX No. 300 & 500 Furnaces Only.
1—BOOTH one ton, direct arc, side charge with 1500 KVA Transformer with gear and all controls.

GAS & OIL FIRED FURNACES
23—LINDBERG FISHER Model MNP Electric Tilting, Sizes 150, 300, 600, 1700, 2000 & 2400#, aluminum capacities. Gas or Oil Fired.
5—LINDBERG FISHER Type BBI Hand Tilting Furnaces, Sizes 100, 125, 225.
29—LINDBERG FISHER & CAMPBELL, HAUSFELD Stationary, Sizes 100, 150, 200, & 550 capacity. Gas or Oil Fired.
1—STROMAN Model JC Cradle Type Hydraulic tilt, 2000# capacity. Iron.

HEAT TREAT FURNACES
1—DESPATCH Model DT-26, 38" diameter x 26" height, gas fired recirculating, 1250°, pit type.
1—SURFACE COMBUSTION, 54" x 96", box-type, gas fired, 1850° F.

GRINDERS
Swing Frame
1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging
2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 30 HP, 4 speed.

Core
2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc
GARDNER No. 124—53" wheel, 20 HP

LADLES
17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity. All Enclosed Gears.
12—MODERN Model F-9 and FA-9 Pouring Devices, with ladles 400 to 800 lbs.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000, & 80,000 lbs. capacity.
7—MODERN & WHITING Cylindrical Mixing Ladles, 2 & 3 ton capacities. Electric & Manual Tilting.
7—WHITING Bottom Pour 4 ton.

MUST BE SOLD
INDIVIDUAL ITEMS OR BULK
WHITING No. 9 Cupola
With Swivel type Charger Skip
Hoist type w/storage hoppers
Scales & Cone Bottom "Wish Bone" Buckets, Mixing Ladle & Blower.

MOLDING MACHINES
Jolt Squeezers
37-OSBORN, SPO, MILWAUKEE, Portable & Stationary, 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & SPO Portable & Stationary, 12" Cylinder.
6—MILWAUKEE 18" Cyl., 24" x 36", Table

Plain Jolt
1—HERMAN 40" x 58" table, 3000# cap.
1—HERMAN 8' x 12' table, 32,000# cap.

Jolt Rollover Pattern Draw
1—DAVENPORT 28-SA, 29" x 40" table.
2—DAVENPORT 40-SA, 42" x 50" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30.
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL Type G, Sizes 20" x 8" 24" x 10".
1—INTERNATIONAL RES Size 15" x 8".
2—J & J #612, 24" x 30" Table.
4—J & J #918, 44" x 54" Table.
1—J & J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
1—MILWAUKEE #60B-3, 60" Flask.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs. Cap.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 9336, table size 22" x 28".
1—SPO Model 508, table size 28" x 30".
1—SPO 506—24" x 30" Table, 10" Draw.
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 32" Table, 10" Draw.

Jolt Pin Lift
3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" table.
2—OSBORN #559, 25" x 30" Table.
2—MILWAUKEE #2542, 38" x 42" Table.
1—SPO #3058, 22" x 28" Table.
1—SPO #3102—42" x 50" Table.

Pin Lift
9—INTERNATIONAL & B & P Speed Draw. Used with Sand Slinger. Cap. 600 to 2000 lbs., up to 30" x 40" flasks.

Jolt Squeeze Pin Lift
1—MILWAUKEE No. 216, 22" x 42" table. 21" dia. sq. cyl.
1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE #165, 24" x 30" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
4—INTERNATIONAL PKL, 17" x 26".
1—INTERNATIONAL PK-20, Size 20" x 8".
1—SPO #2134, 19" x 27" Table.

CONVEYORS
Steel Apron
9—JEFFREY & LINK BELT 24", 30", 36", 42", & 48" Widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating
1—LINK BELT 48" x 154', 20 HP Motor.
4—LINK BELT 30" W x 45', 65' & 80'.
1—ROBINS Vibra-Veyor 24" W x 100' long x 8" deep pan, New 1953, like new.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.

Roller
2500' MATHEWS 6", 12", 18" & 20" wide. 2 7/8" dia. roller, 1½" hex shaft centers, 4" channel.
500—MATHEWS 12" & 36" wide, 3½" dia. 1" hex shaft on 6" centers, 6" channel.

Mold
1—LINK BELT 36 cars 4' x 5', 190' track, with automatic dump. New 1952.
3—LINK BELT 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt
LINK BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

MOLDERS HOPPERS & STORAGE BINS
7—NATIONAL & LINK BELT Storage Bins, 60 to 150 tons cap.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS
1—B & P #50, Speed Muller, 9 cu. ft.
1—B & P #60, Speed Muller, 12 cu. ft.
2—B & P #70, Speed Mullers, 18 cu. ft.
1—BAKER PERKINS #16½, 30 HP.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu. ft. batch.
1—DRAVO-DOYLE 6 cu. ft. cap. Port.
1—LINK BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH
1—SIMPSON #0, Style B, 175 lb.
1—SIMPSON #1½, Style UD w/loader.
1—SIMPSON #2, Style C, 1500 lb.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu. ft. paddle type.

SAND PREPARATORS
2—NATIONAL #3 Style C Aerators.
6—ROYER Complete conditioning units including Shakeout, Belt Conveyor and Sand Blender.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M. Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—ROYER S-522-9M Scrap Control 60 ton per hour capacity.
1—AMERICAN "Sand Master," 102"/70" cutting blade—1952.
1—MOULDERS' FRIEND 60" Brush.
1—REDDY-SANDY Model RS-VM.

SANDSLINGERS
1—B & P Motive Jr., 300 cu. ft. tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms. Magnetic towers.
6—B & P Models DS Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
1—B & P 2 ton plate feeder.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.
2—B & P 16' Dia. Turntables Indexing

SHAKEOUTS & SCREENS
2—LINK BELT 5' x 10', 6 ton cap.
1—ROBINS 8' x 10' Model JF-11 Dual.
2—ROBINS 3' x 5' shakeouts.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
1—HEWITT - ROBINS Vibra - Feeder 30" wide x 60" long.
1—SIMPLICITY 4' x 6' Model B.

SAND BLAST EQUIPMENT
1—AMERICAN 36" x 42", w/Skip Hoist.
2—AMERICAN 48" x 42", w/skip Hoist.
1—AMERICAN 27" x 36" with skip hoist.
1—AMERICAN 48" x 48".
1—AMERICAN No. 1-B Suction Cabinet.
1—AMERICAN #3 Tablast, 4—48" tables.
1—AMERICAN #1 Tablast, 7—14" tables.
1—AMERICAN No. 2A multi-tablast.
1—AMERICAN 20" x 27" Rubber Belt Tumblast.
1—PANGBORN #45, type MT Sand Blast Room 10' L x 8' W x 6' H.
1—PANGBORN No. 53 type EN-2 blast cabinet with dust collector.
1—PANGBORN Model 6-LF, 6' diameter plain table with dust collector.
1—PANGBORN #44NF Shot Blast Room 10' x 9' x 9'.
SLY—12' x 12' x 7' Shot Blast Room w/10,000 CFM Dust Filter Collector.

TUMBLING BARRELS
13—SLY & WHITING. All late type units, with gearhead motors and built in magnetic brake, Timken bearings. Following sizes: 30" x 48", 24" x 48", 30" x 60", 36" x 84", 42" x 72", 48" x 72", 48" x 96", 72" x 120".

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REBUILT EQUIPMENT GUARANTEED

AIR COMPRESSORS
COMPLETE STOCK—BURY, PENNSYLVANIA, SULLIVAN, INGERSOLL-RAND —SEND YOUR REQUIREMENTS

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM-GREEN, FISHER Positive Pressure & Cent, Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—AMERICAN WHEELABRATOR TUMBLAST, 15" x 20", w/dust collector
1—AMERICAN #1 MULTITABLE TABLAST, 17" Table
1—AMERICAN WHEELABRATOR TUMBLAST, 42" x 48" w/loader
1—15" Continuous AMERICAN TUMBLAST, 4 tons per hour capacity
1—AMERICAN WHEELABRATOR, 36", Continuous Side Discharge, Two Head, Serial #A95643, New 1953, Used 2 Months
1—AMERICAN WHEELABRATOR TUMBLAST 27" x 36"
1—AMERICAN WHEELABRATOR TUMBLAST 36" x 42"
1—PANGBORN 6' TABLE-ROOM, Type LK,
1—PANGBORN TABLAST, 8' Table
10—WHITING 36" x 36" x 72" w/gear head motors & brakes
1—WHITING 36" x 72" Round w/gear head motors & brakes
1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round

CONVEYORS
1—HEWITT ROBINS Vibrating, 18" x 10'
1—JEFFREY, 3 compartment, ingot mold
1—LINK BELT, vibrating, double deck, 80' x 24", w/exhaust hood
1—LINK BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
2—LINK BELT 30" Steel Apron Conveyors, 100' Centers
4—SAND ELEVATORS, Various sizes
6—SAND BELTS, 10' ctrs. to 140' ctrs.
2500 FEET—FOUNDRY TYPE ROLLER CONVEYOR—ALL SIZES

CORE BLOWERS
1—CHAMPION CB-12
10—DEMMLER #1, #2, #2A, #2K, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10.
1—RANDALL, MODEL "A", Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS
1—MORRIS #9, Skip charger, Blower, Mixing Ladle, Never Installed
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—TABOR Cupolette, 48" dia. 9" cap.
1—WHITING Skip Charger for #5 Cupola
1—WHITING #4 w/charger & blower, Foxboro Control
2—WHITING #6 w/Skip Chargers, Blowers, and Foxboro Controls

DUST COLLECTORS
1—AMERICAN WHEELABRATOR, Model #115KD, 20' L x 9' W x 9' H
10—ROTOCLONE #12, Type N, #14D, #16W, #20D, #24W, #30W

FLASKS
150 HINES AND FREEMAN ALUMINUM, Popoffs and Jackets
CHERRY WOOD Snap Flasks
200 TRANSITE CORE PLATES, Various sizes
SEND US YOUR REQUIREMENTS

FURNACES—DIRECT ARC MELTING
1—3000# HEROULT
1—6 Ton HEROULT
1—250 Lb. LECTROMELT, Side Charge
1—3,000#/hr. LECTROMELT

FURNACES—INDIRECT ARC
1—10# DETROIT Lab Type
1—350# DETROIT LFA
1—500# DETROIT, LFN, Hydraulic
1—750# DETROIT LFY, Conical Shell
1—1500# DETROIT AA, 300 KVA
1—3000# DETROIT C, 500 KVA

FURNACES—INDUCTION MELTING
1—3KW, AJAX, Lab type
1—20 KW, AJAX SPARK GAP, High Frequency
1—30 KW LEPEL, 17 lb.
1—20 KW AJAX 50# capacity, MG set.
1—333 KW AJAX 1000#

IMMEDIATE DELIVERY

3 Ton Top Charge

SWINDELL ARC FURNACE

Unit is in Excellent Condition, Dismantled, ready for Immediate Delivery.

FURNACES—GAS & OIL
1—FISHER MNP, Gas Tilting, 1700# cap. Mag.
2—FISHER, Gas, Stationary, 4 Burner, 500# cap.
1—HAUSFELD, Tilting, 1200# capacity
1—STROMAN, Gas Tilting, 1000# cap. Alum., auto control hyd. lift
1—REDA 550#.

GRINDERS
1—5 HP CINCINNATI, 2/60/110
1—5 HP GARDNER, 12" x 2½" wheels
3—5 HP U. S. Model 64, 14" x 2" wheels
1—7½ HP U. S. 2300-8400 RPM, 14" x 2" wheels
1—7½ HP U. S. 3/60/220, 20" wheels
1—7½ HP U. S. Model 66, 14" x 3" wheels
1—10 HP U. S. Model 65, 20" x 3" wheels
3—10 or 15 HP SWING FRAME, 22" wheels.

MOLDING MACHINES
Jolt Rollover Pattern Draw
1—J & J #1020, 50" x 60" Table, 3000#
2—J & J #918, 44 x 54 Table, 20" draw
1—J & J #815, 30" x 40", 15" draw, 1200# Jolt
2—INTERNATIONAL, 13" x 17" table, 6" draw
2—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 50" x 72"
1—HERMAN 3000#, 30" x 66" Table
2—HERMAN 1500#
1—HERMAN 750#, 30" x 36"
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 50", 18" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000# capacity
2—TABOR, 30" x 40" w/air clamps, 1000#
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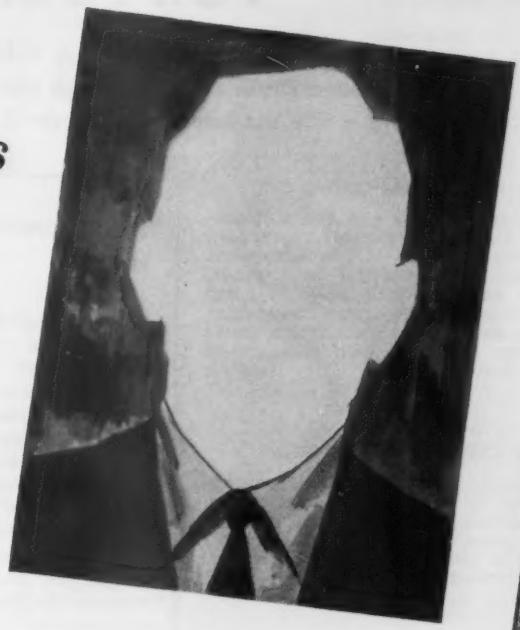

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Advertising Index

Abrasive Shot & Grit Co., Inc. 213
Accurate Match Plate Co. 125
Ace Laboratories 230
Acme Foundry Co. 74
Adams Co., The 18
Air Reduction Co., Inc., Pure Carbonic Co., Division 232
Ajax Electric Co. 15
Ajax Electrothermic Corporation 15
Ajax Engineering Corporation 15
Allied Chemical & Dye Corporation, Baker & Adamson General Chemical Division .. 229
Allied Chemical & Dye Corporation, Semet-Solvay Division 194
Alloy Metal Abrasive Co. 212
Alloy Metal Products, Inc. 26
American Air Filter Co., Inc. 38
American Foundry Flask Co. 231
American Gum Products Co. 235
American MonoRail Co. 48
American Optical Co. 36
Anderson Pattern, Inc. 208
Ansco, A Division of General Aniline & Film Corporation 6
Archer-Daniels-Midland Co., Federal Foundry Supply Division 2, 4, 5

Babcock & Wilcox Co., The, Refractories Division 145
Baird-Atomic, Inc. 198
Bakelite Co., Division of Union Carbide Corporation 62
Baker & Adamson General Chemical Division, Allied Chemical & Dye Corporation 229
Bartlett, C. O., & Snow Co., The ..... Back Cover
Bay State Abrasive Products Co. 46, 47
Beardsley & Piper Division, Pettibone Mulliken Corporation 141, 142, 175, 176
Berkshire Chemicals, Inc. 227
Bin-Dicator Co., The 233
Branford Co., The 235
Buda Division, Allis-Chalmers 7

Campbell-Hausfeld Co., The 12
Carborundum Co., The ..... Inside Front Cover
Carman, Edwin S., Inc. 232
Carrier Conveyor Corporation 167
Carver Foundry Products Co. 181
Case, J. I., Co. 149
Cement Gun Co. 210
Centrifugal Casting Machine Co. 229
Chicago Eye Shield Co. 184
Cincinnati Milling Machine Co., The 75
Cities Service Oil Co. 207
City Pattern Foundry & Machine Co. 27
Clearfield Machine Co. 153
Cleco Division of the Reed Roller Bit Co. 138
Cleveland Flux Co., The 117
Cleveland Metal Abrasive Co., The 201
Cleveland Tramrail Division, The Cleveland Crane & Engineering Co. 66
Cleveland Vibrator Co., The 72
Climax Molybdenum 129
Columbia-Southern Chemical Corporation 231
Combined Supply & Equipment Co., Inc. 211

Davenport Machine & Foundry 203
Dayton Pneumatic Tool Co. 233
DeBardeleben Coal Corporation 234
Deister Concentrator Co., The 222
Delta Oil Products Co. 44
Demmler Manufacturing Co. 67
Desmond-Stephan Manufacturing Co., The 170
Detroit Electric Furnace Division, Kuhlman Electric Co. 205
Diamond Alkali Co. 234
Dietert, Harry W., Co. 131
Domestic Industries, Inc. 115
Dow Corning Corporation 68
Dry Ice Converter Corporation 171
Durez Plastic Division, Hooker Electrochemical Co. 173

Eastern Clay Products Department, International Minerals & Chemical Corporation 58, 59
Eastman Kodak Co., X-Ray Division 119
Electro Metallurgical Co., Division of Union Carbide Corporation 61
Elwell-Parker Electric Co., The 165
Euclid Crane & Hoist Co., The 230

Fanner Manufacturing Co., The 154, 155
Federal Foundry Supply Division, Archer-Daniels-Midland Co. 2, 4, 5
Foundry Equipment Co., The 9
Foundry Supplies Manufacturing Co. 24
Foxboro Co., The 42
Frontier Bronze Corporation 228

Gardner-Denver Co. 159
General Aniline & Film Corporation, Ansco Division 6

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Advertising Index

General Dynamics Corporation, Liquid Carbonic Division 157
General Refractories Co. 225
Globe Steel Abrasive Co., The 164
Goodrich, B. F., Industrial Products Co. 1
Gordon, Claud S., Co. 211
Great Lakes Carbon Corporation 228
Great Western Manufacturing Co. 247
Green, A. P., Fire Brick Co. 219
Grinding & Polishing Machinery Corporation .. 196

Hall, Lees & Sons Ltd. 70
Hanna Furnace Corporation, The 188
Hannifin Co. 57
Harbison-Walker Refractories Co. 11
Hartley Controls Corporation 210
Henning Brothers & Smith, Inc. 230
Herman Pneumatic Machine Co. 16, 17
Hewitt-Robins 174
Hickman, Williams & Co. 199
Hines Flask Co., The 40, 41
Hooker Electrochemical Co., Durez Plastics Division 173
Hough, Frank G., Co., The 32
Hunt, C. B., & Son, Inc. 180
Hyster Co. 43

Imperial Belting Co. 10
Industrial Equipment Co. 233
International Foundry Supply Co. 214
International Minerals & Chemical Corporation, Eastern Clay Products Department 58, 59
International Molding Machine Co. 137
Ironton Fire Brick Co. 195, 197

Jeffrey Manufacturing Co., The 54
Jersey Manufacturing Co. 228
Johnston Manufacturing Co. 224
Joy Manufacturing Co. 156

Keystone Refractories Co., Inc. 229
King Tester Corporation 204
Kirk & Blum Manufacturing Co., The 168
Knight, Lester B., & Associates, Inc. 56
Kuhlman Electric Co., Detroit Electric Furnace Division 205
Kwik-Mix Co. 152

Laclede-Christy Works, Refractories Division, H. K. Porter Company, Inc. 183
Lanly Co., The 39
Leeds & Northrup Co. 196
Lemmon & Snoap 247
Link-Belt Co. 45
Liquid Carbonic Division of General Dynamics Corporation 157
Logan Co. 132

McDonald Charcoal Co. 228

Marshall, L. H., Co. 162
Master Pneumatic Tool Co., Inc., The 227
Mayer, Carl, Corporation, The 148
Metal Blast, Inc. 133
Milwaukee Chaplet & Manufacturing Co. 215
Minneapolis-Honeywell Regulator Co. 127
Minnesota Mining & Manufacturing Co. 21
Modern Equipment Co. 248
Mullite Works, Refractories Division, H. K. Porter Company, Inc. 182

National Engineering Co. 30, 31, 135
National Metal Abrasive Co. 124
Newaygo Engineering Co. 25
New York & New Jersey Lubricant Co. 224
Nicholls, William H., Co., Inc. 19
Nomad Equipment Division, Westover Corporation 194
Norton Co. 8, 28, 29, 50

Ohio Crankshaft Co., The 37
Ohio Electric Manufacturing Co. 216
Oliver Machinery Co. 232
Orefraction, Inc. 120
Osborn Manufacturing Co., The 122, 123
Ottawa Silica Co. 20

Pangborn Corporation 69, 71, 73
Pekay Machine & Engineering Co., Inc. 53
Penn Iron Works, Inc. 140
Pettibone Mulliken Corporation, Beardsley & Piper Division 141, 142, 175, 176
Philadelphia Quartz Co. 247
Pickands Mather & Co. 223
Pittsburgh Coke & Chemical Co. 163
Planet Corporation 177
Porter, H. K., Company, Inc., Laclede-Christy Works, Refractories Division 183
Porter, H. K., Company, Inc., Mullite Works, Refractories Division 182
Pressed Steel Co., The 146
Pure Carbonic Co., A Division of Air Reduction Co., Inc. 232
Pyle Pattern & Manufacturing Co. 55

Redford Iron & Equipment Co. 60
Reed Roller Bit Co., Cleco Division 138
Reichhold Chemicals, Inc. 187
Republic Steel Corporation 64, 65
Robeson Process Co. 235

Schneible, Claude B., Co. 220
Schu Products Co. 234
Semet-Solvay Division, Allied Chemical & Dye Corporation 194
Sidley, R. W., Inc. 230
Simonds Abrasive Co. 63
Smith, G. E., Inc. 49
Spencer Turbine Co., The 200
States Engineering Corporation 232
Sterling Wheelbarrow Co. 76, 146
Stevens, Frederic B., Inc. ..... Inside Back Cover
Stroman Furnace & Engineering Co. 227

Tabor Manufacturing Co., The 161

Union Carbide Corporation, Bakelite Co., Division 62
Union Carbide Corporation, Electro Metallurgical Co., Division 61
United States Forge & Foundry Co. 230
United States Graphite Co., The, Division of The Wickes Corporation 147, 221
United States Electrical Tool Co. 14
United States Rubber Mechanical Goods Division 111

Vanadium Corporation of America 209

Wedron Silica Co. 169
Westover Corporation, Nomad Equipment Division 194
Wheelabrator Corporation 13, 178
Whirl-Air-Flow Corporation 208
Whitehead Brothers Co. 35
Whitehead Metal Products Co., Inc. 206
Whiting Corporation 113
Wickes Corporation, The, The United States Graphite Co., Division 147, 221

Classified Advertising 236, 237, 238, 239, 240, 241, 242

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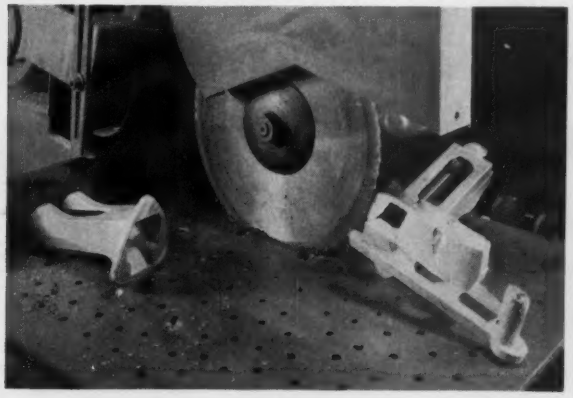

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Circle 737 on Page 51

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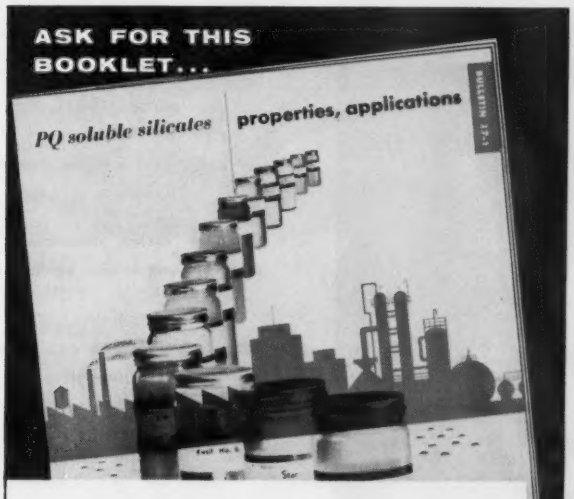

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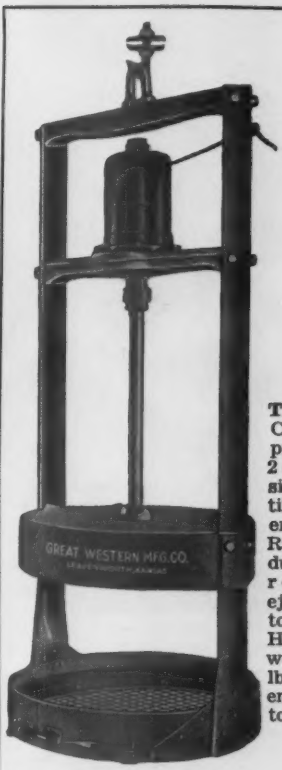

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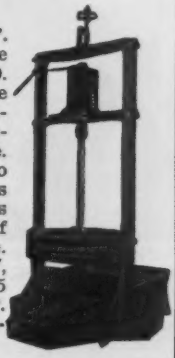

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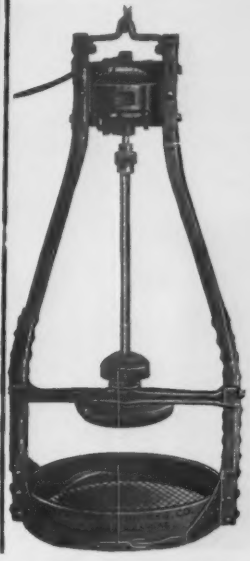

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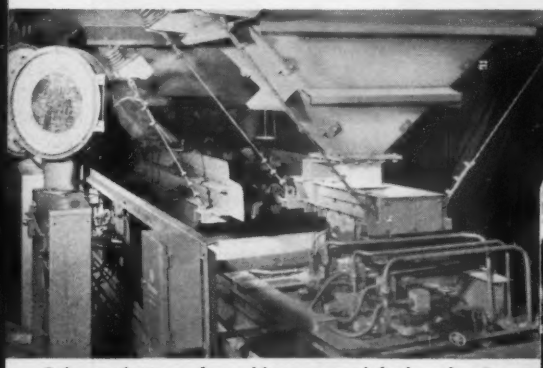

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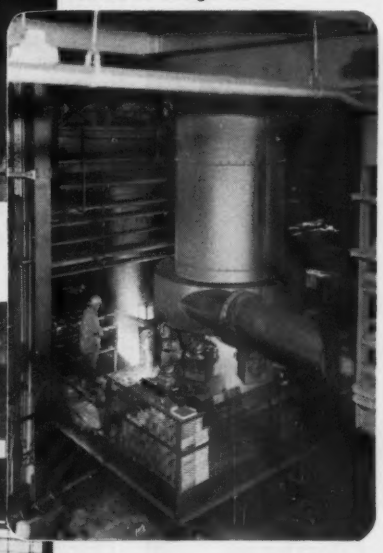
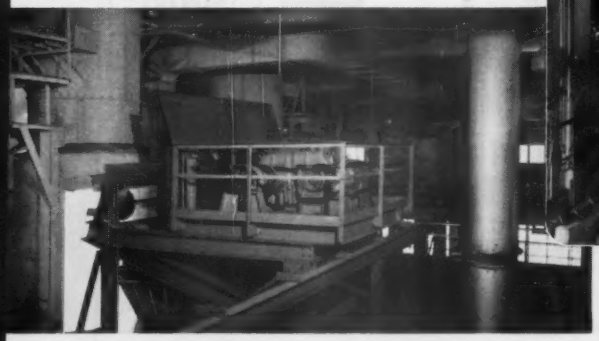
Upper portion of charger indexes to serve more than one cupola.

Slag is granulated in water and flows to sludge tank.



DIFFERENCES IN —

- *lengths of melting time and types of iron may alter cupola designs . . .*
- *cupola locations and yard conditions call for differences in swiveling and indexing of the charger . . .*
- *charging cycles determining the stock bin and feeder equipment.*
- *automatic weighing and recording instruments — inventory the components, eliminate human error and insure uniformity of metal . . .*



Modern cupolas with continuous-tapping, front slagging spouts.

In all these and other ways MODERN's single responsibility for engineering, fabrication and erection is cutting the tonnage costs for the Bullard Company. Other case studies in catalog 147-C . . .

MODERN EQUIPMENT COMPANY, Dept. F-7, Port Washington, Wisconsin

Mail to my attention:

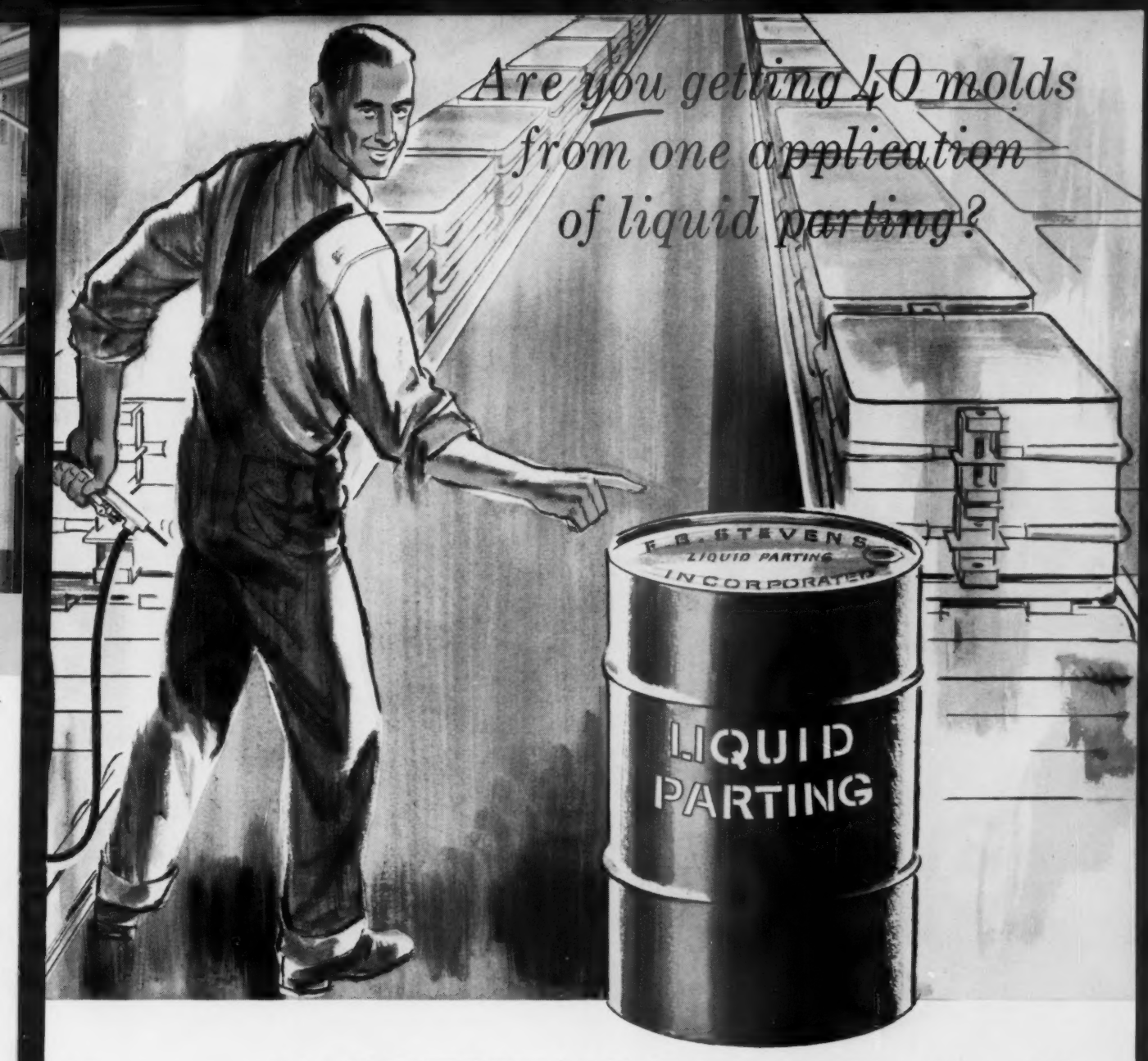
- ☐ Catalog 147-C on charging and melting . . .
- ☐ Catalog 150 on cranes, and monorail systems . . .
- ☐ Catalog P-152-A on ladles and pouring . . .

Company.....

Street.....Box.....

City.....Zone.....State.....

My Name.....



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Circle 552 on Page 51

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